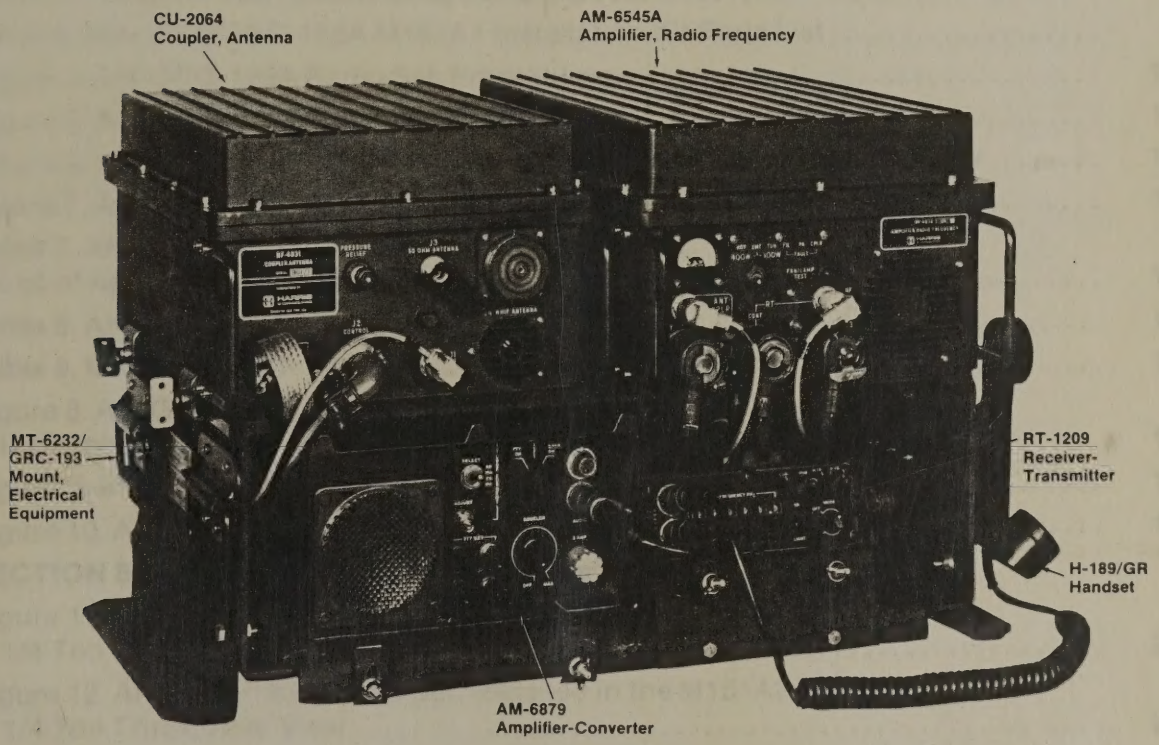
AN/GRC-193A
400/100 Watt HF
RADIO SET



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IHFR PROGRAM SYNOPSIS

The INTACS UPDATE of 1979, performed by the U.S. Army Signal Center and Fort Gordon, Ft. Gordon, Georgia, brought forth the requirement for an NDI High Frequency radio for the U.S. Army. The Communications Electronics Test Board, Fort Gordon, Georgia was tasked to evaluate existing non-developmental HF radios available off-the-shelf. In April 1980 an HF radio CEP (Concept Evaluation Program) was begun. In June of 1980, the AN/GRC-193A Radio Set was chosen by the U.S. Army as the High Power Improved High Frequency Radio (IHFR).

The following is a status of the AN/GRC-193A critical milestones from development to date:

a. AN/GRC-193 HF Radio Equipment
   1. 1067 AN/GRC-193s built and delivered to USMC (contract N00039-75-C-0022).
   2. 170 AN/GRC-193s for the USMC now in production (contract N00039-81-C-0012).
   3. Over 500 GRC-193s installed in M151A2 vehicles at MCLB Albany, Georgia and Barstow, California.
   4. Deployed in USMC MAFs.
   5. Provisioning completed (MCLB, Albany, Georgia).
   6. Training-course materials developed, instruction of operators and maintenance personnel currently in progress (MCCES, 29 Palms, California).
   7. Manual (including Maintenance Prints and Rebuild Standards)—written and printed.
   8. Spares (maintenance float equipment, modules and unique parts)—delivered and in place at MCLB, Albany, Georgia and Barstow, California.
      NOTE: Prior to production start, the GRC-193 equipment passed FA lab tests at NOSC, San Diego, California and 9 month operator-evaluation at 2nd MARDIV in Camp LeJeune, North Carolina.

b. U.S. Army evaluation and test of AN/GRC-193A HF Radio System
   1. HF Radio CEP, U.S. Army C&E Board, Ft. Gordon, Georgia (April-June, 1980).
   2. SHORAD test/evaluation, CORADCOM and 3/61 ADA Bn Germany (May 1980).
   3. SHORAD TEST BED, USAADBD, Ft. Bliss, Texas (April-May 1981).
   4. Border Star, 155 ADA Bn, Ft. Bliss, Texas (May 1981).
   5. Installation check in M151A2, M113, M577 and M822 vehicles, CORAD Com, Ft. Monmouth, New Jersey (May 1981).
   6. REFORGER, Europe (September 1981).
   7. Production run of AN/GRC-193A for U.S. Army (June 1983).
   8. Fielding of the AN/TRC-184 to 56th Bde (February 1984).
   9. Fielding of 120 units AN/GRC-193A to Combat Service Supply and units (started in September 1984).

INTRODUCTION

The AN/GRC-193A 400/100 Watt HF Radio Set is a system specifically designed to meet U.S. Army requirements for use in wheeled and tracked vehicles and base stations. The basic equipment complement (see Figure 1 for detailed descriptions and specifications), the RT-1209 Receiver-Exciter, AM-6879 Amplifier-Converter, AM-6545A Power Amplifier and CU-2064 Antenna Coupler is the same in both systems and is already in the U.S. military inventory p/o the USMC AN/GRC-193 Radio Set. The RT-1209 Receiver-Exciter is also common with the AN/PRC-104 20 W HF Packset and AN/GRC-213 used by all four U.S. military services.

The AN/GRC-193 HF Radio Set is an extremely rugged, 400 watt SSB tactical transceiver system. It is designed to provide reliable, long range HF voice and data communications for both mobile and fixed stations. Its high-power transmission capability, not normally found in mobile installations, provides reliable communications in the most demanding environments.

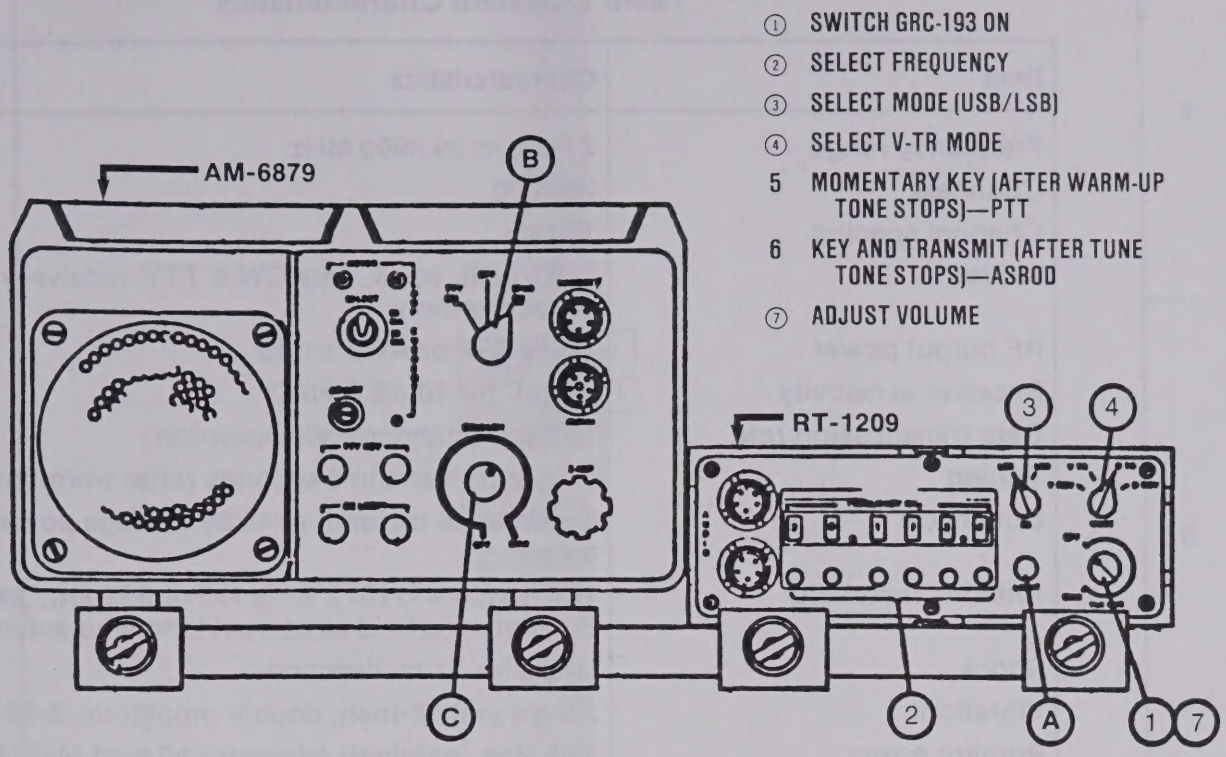
The system can be installed in the M151A2 standard 1/4 ton utility vehicle, the multipurpose, 1¼ ton, 4 x 4, AM General M998 Series HUMMER, or other military vehicles. Operational flexibility is enhanced by compatability with ancillary equipment and by the capability for remoting the main system components.

Main Features of the GRC-193A Radio Set:

- Full field compatibility with existing HF tactical radios, including AN/GRC-106, AN/MRC-138, AN/PRC-104, AN/PRC-74, AN-PRC-87, AN/GRC-165, AN/URC-58, and AN/URC-94(V).
- Completely automatic tuning in less than 6 seconds after frequency and mode selection and momentary keying of the radio set.
- Full rated 400 W PEP or Average output at continuous TX duty cycle under any worst case combination of environmental (e.g., temperature) and primary power supply conditions.
- High efficiency - current drain less than 45 A at 26.5 vdc, at 400 W Average power output, therefore, the system can be readily powered from standard 60 A vehicular-battery alternator. Typical current drain is shown below.

Mode	Power Output (Watts)	Supply Current (Amp)
CW (key down)	400 Average	42.5
Two-tone	400 PEP	31.0
Voice	400 PEP	17.0
Receive	---	5.5
Receive only	---	.5

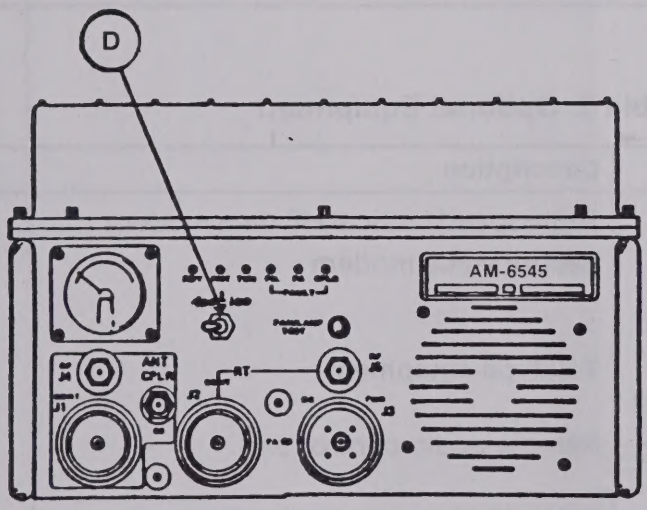
- Rugged, submersible - all equipment specifically designed for MIL ground mobile applications, sealed units submersible in 3 feet of water, have passed MUNSON ROAD TEST.
- Deployment flexibility - building block design allows a wide variety of configurations to meet operational and tactical requirements (e.g., remoting the antenna and antenna coupler, shelter installations like TPQ-27 and UYQ-3A.
- Compatibility with various ancillary equipment, e.g., VIC-1 Intercom, TGC-14A and UGC-74 Teletype, GRA-39C Radio Control Group, a variety of standard and field expedient antennas (AS-2259 NVIS, AT-1011, GRA-50, RF-1912, long wire, etc.), voice security equipment, and RF-3466T High-Speed Tactical HF Data Modem.
- Modular construction, meter and fault isolation indicators for easy maintenance.
- Built-in protection against abnormal operating conditions (e.g., shorted antenna, reversed polarity power supply, overtemperature, overvoltage).
- Built-in teletype ±425 Hz shift keyer-converter (P/O AM-6879 Amplifier-Converter).
- 400 W or 100 W power output selection (front panel control on AM-6545A).
- Ease of operation (see page 3 for AN/GRC-193A operating instructions).



① SWITCH GRC-193 ON
② SELECT FREQUENCY
③ SELECT MODE (USB/LSB)
④ SELECT V-TR MODE
5 MOMENTARY KEY (AFTER WARM-UP TONE STOPS)—PTT
6 KEY AND TRANSMIT (AFTER TUNE TONE STOPS)—ASROD
⑦ ADJUST VOLUME

AS REQ[D]

Ⓐ PRESS TO LIGHT FREQ. DISPLAY
Ⓑ SWITCH ON SPEAKER
Ⓒ ADJUST TO JUST SQUELCH NOISE (SPEAKER)
Ⓓ SELECT 400W OR 100W POWER OUTPUT



• USE 400W SETTING WHEN TUNING WITH REMOTED CU-2064

NOTES: 1. RECEIVE OPERATION IS POSSIBLE AFTER STEP ④ (UNTUNED ANTENNA)

Figure 1. AN/GRC-193A Operating Instructions

Table 1. System Characteristics

Item	Characteristics
Frequency range	2.0000 to 29.9999 MHz
Channels	280,000
Channel spacing	100 Hz
Modes	USB, LSB, voice, data CW & TTY; receive-transmit or receive-only
RF output power	400W PEP or AVG ±1 dB
Receiver sensitivity	0.7 mV for 10 dB SINAD
Data transmission rate	75 baud (standard teletypewriter)
Tuning	Fully automatic in 6 seconds (after warmup)
Duty cycle	Continuous transmit at 400W average power output
Antenna matching	Will match AT-1011 Whip (15 or 35 foot); AS-2259, doublet; or a field expedient long wire antenna
Shock	20 g's for 11 milliseconds
Vibration	2.5 g's or 0.15-inch, double amplitude, 5-55 Hz
Primary power	26.5 Vdc (nominal) (standard 60 amp M151A2 battery-alternator system)
Current drain	45 amp at 400W average power output; less than 0.5 amp in receive-only mode
Temperature of operation	-40° C (-40° F) to +55° C (+131° F)
Altitude	0 to 10,000 feet, operating
Immersion	3 feet of water - 4 hours

Table 2. Optional Equipment

Item	Description
RF-3466T	High-speed tactical HF data modem
Parkhill, Communication Security Equipment TSEC/KY-65	Secure voice modem
Teletypewriter Set AN/TGC-14A(V) or equivalent	Teletype equipment
Radio Set Control Group AN/GRA-39C	Remote audio control unit
Power Supply PP-7333/GRC	115V, 60 Hz power converter
Headset H-140A/U or equivalent	Headset
Antenna	AS-2259 Antenna or doublet antenna or long wire antenna
Antenna Adapter MX-9913/( )	Field Expedient for use with AS-2259

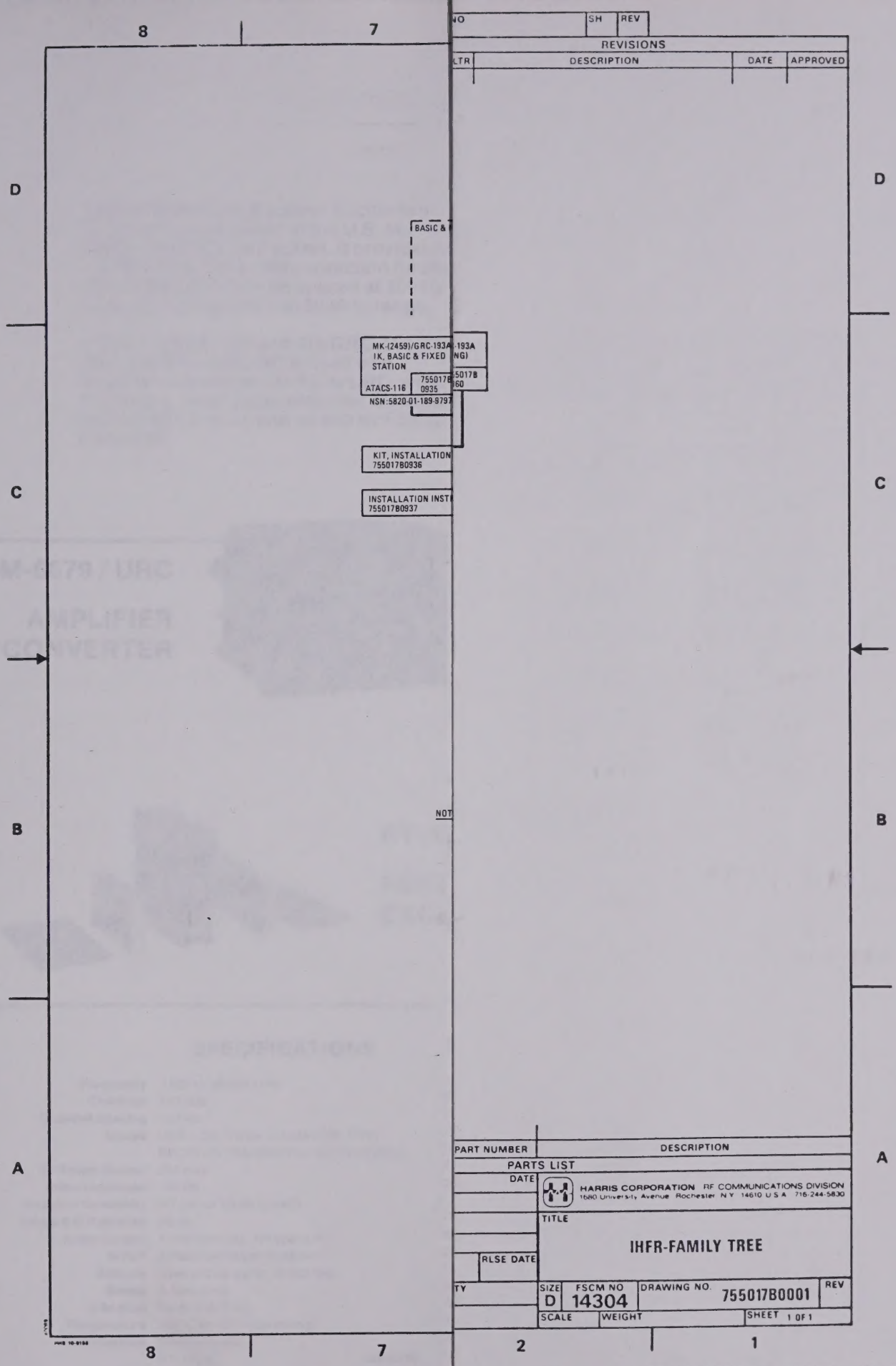


Figure 2. IHFR (AN/GRC-193A) Family Tree

Table 1. System Characteristics

Item	Characteristics
Frequency range	2.0000 to 29.9999 MHz
Channels	280,000
Channel spacing	100 Hz
Modes	USB, LSB, voice, data CW & TTY; receive-transmit or receive-only
RF output power	400W PEP or AVG ±1 dB
Receiver sensitivity	0.7 mV for 10 dB SINAD
Data transmission rate	75 baud (standard teletypewriter)
Tuning	Fully automatic in 6 seconds (after warmup)
Duty cycle	Continuous transmit at 400W average power output
Antenna matching	Will match AT-1011 Whip (15 or 35 foot); AS-2259, doublet; or a field expedient long wire antenna
Shock	20 g's for 11 milliseconds
Vibration	2.5 g's or 0.15-inch, double amplitude, 5-55 Hz
Primary power	26.5 Vdc (nominal) (standard 60 amp M151A2 battery-alternator system)
Current drain	45 amp at 400W average power output; less than 0.5 amp in receive-only mode
Temperature of operation	-40° C (-40° F) to +55° C (+131° F)
Altitude	0 to 10,000 feet, operating
Immersion	3 feet of water - 4 hours

Table 2. Optional Equipment

Item	Description
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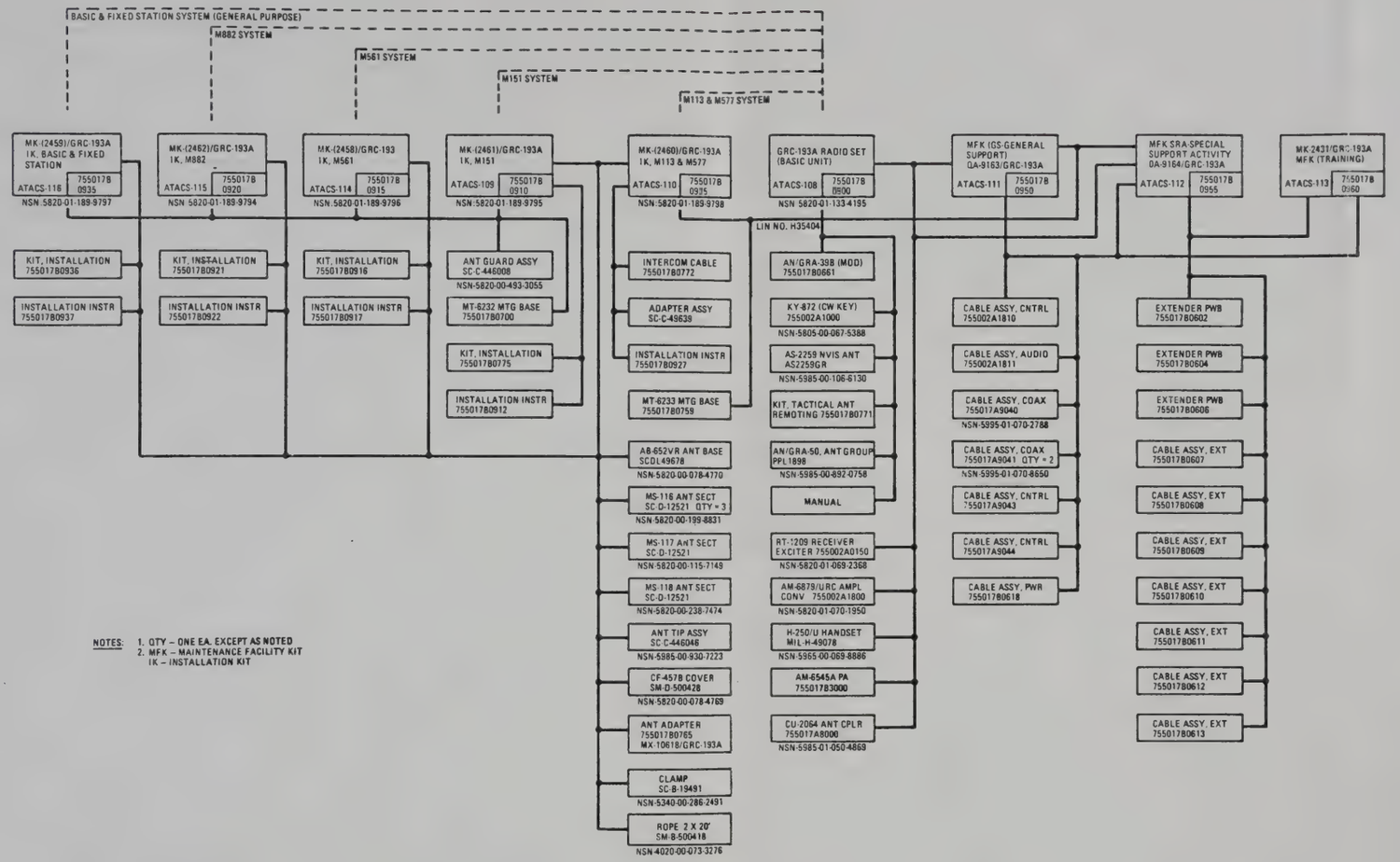
Antenna	AS-2259 Antenna or doublet antenna or long wire antenna
Antenna Adapter MX-9913/( )	Field Expedient for use with AS-2259



NOTES: 1. QTY – ONE EA. EXCEPT AS NOTED
2. MFK – MAINTENANCE FACILITY KIT
IK – INSTALLATION KIT

QTY	ITEM NO	FSCM NO	SPECIFICATION	PART NUMBER	DESCRIPTION

PARTS LIST

DIMENSIONS ARE IN INCHES
TOLERANCES
FRACTIONS ± 1/64
ANGLES ± 1°
DEC XX ± 02 XXX ± 005
MFG SPEC
MATL
FNSH

DR DATE
CHK
ENGR
APVD
CONTR NO RLSE DATE
DSGN ACTIVITY APPROVAL
APPROVED

HARRIS CORPORATION RF COMMUNICATIONS DIVISION
1680 University Avenue Rochester N.Y. 14610 U.S.A. 716 244-5630

TITLE: IHFR-FAMILY TREE

SIZE D | FSCM NO 14304 | DRAWING NO 75501780001 | REV
SCALE | WEIGHT | SHEET 1 OF 1

NEXT ASSY	USED ON
	APPLICATION

Figure 2. IHFR (AN/GRC-193A) Family Tree

Antenna Coupler is a fully-
gh-frequency, antenna matching
ning elements and control
ontained in a single unit.
will tune 15 and 35 foot whip
ublet antennas, and the AS-2259
CU-2064 has a rated power
ability of 400 watts PEP or average
any of the antennas listed above
1.4:1 or better.

is "state-of-the-art" in mechanical
l operational reliability. It is fully
d submersible.

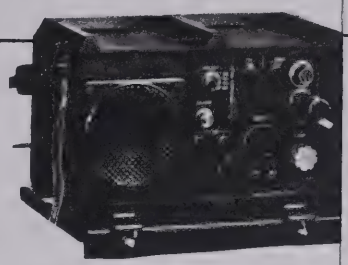
is designed for the U.S. Marine
RC-138 and AN/GRC-193
is also fully compatible with
ar, transportable-shelter, and
ions.

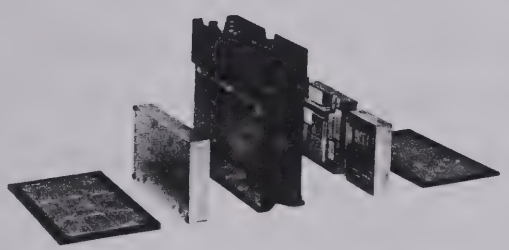
The RT-1209/URC Receiver-Exciter is a common unit also used in the U.S. Marine Corps AN/PRC-104 Packset. It provides U or LSB voice, CW or data operation on any one of 280,000 channels spaced at 100 Hz intervals through the 2 to 30 MHz range.

In the AN/MRC-138 and AN/GRC-193 Rad Sets, the RT-1209/URC is used with Amplifier-Converter AM-6879/URC, which contains a 1 watt audio amplifier, a speake and squelch circuit, and an 850 Hz FSK Ke Converter.

AM-6879 / URC

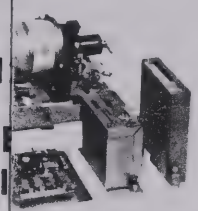
AMPLIFIER CONVERTER





RT-1

REC
EXC



ANTENNA COUPLER

SPECIFICATIONS

Frequency	2,000 to 29,999 MHz
Channels	280,000
Chennel Spacing	100 Hz
Modes	USB, LSB; Voice or Data (CW, TTY) RECEIVE-TRANSMIT or RECEIVE ONLY
RF Power Output	250 mW
Intermodulation	-40 dB
Receiver Sensitivity	0.7 μV for 10 dB SINAD
Image & IF Rejection	80 dB
Audio Output	5 mW handset, 1W speaker
MTBF	2400 hours (specification)
Altitude	Operational up to 10,000 feet
Shock	3-foot drop
Vibration	2.5 g, 5-500 Hz
Temperature	-45°C to +71° (operating)
Immersion	3 feet of water

	RT-1209	AM-6879
Size	2.6H x 7.25W x 7.25D inches	5.7 H x 10.0 W
Weight	5.8 pounds	8.5 pounds

SPECIFICATIONS

o 30 MHz
0 watts PEP or average
to 400 watts
tomatic — less than 6 seconds
ohms
4:1 VSWR maximum, referenced to 50 ohms
ntinuous key-down transmit
5 Vdc; 3 amps average. 9 amps peak (22 to 30V range)
and 35 foot whip, doublet AS-2259, long wire
00 hours (specification)
erational up to 10,000 feet
g's, 11 msec
5 g's or 0.15 in. double amplitude, 5-55 Hz
0°C to +55°C (operating)
feet of water
0H x 11.4W x 14.8D inches
pounds

Figure 3. Functional Building Blocks

The RT-1209/URC Receiver-Exciter is a common unit also used in the U.S. Marine Corps AN/PRC-104 Packset. It provides USB or LSB voice, CW or data operation on any one of 280,000 channels spaced at 100 Hz intervals through the 2 to 30 MHz range.

In the AN/MRC-138 and AN/GRC-193 Radio Sets, the RT-1209/URC is used with Amplifier-Converter AM-6879/URC, which contains a 1 watt audio amplifier, a speaker and squelch circuit, and an 850 Hz FSK Keyer Converter.

The AM-6545 is a fully automatic, high efficiency, 2 to 30 MHz RF power amplifier with integral power supply, control circuits, and heat exchanger. This fully militarized and submersible power amplifying unit has a rated continuous duty power output of 400 watts PEP or average under worst case environmental conditions.

The AM-6545 is designed for the U.S Marine Corps AN/MRC-138 and AN/GRC-193 Systems, but can also be used in a variety of vehicular, shelterized, and fixed station applications.

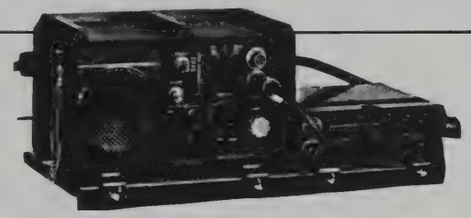
The CU-2064 Antenna Coupler is a fully-automatic, high-frequency, antenna matching unit. All matching elements and control circuitry are contained in a single unit. This coupler will tune 15 and 35 foot whip antennas, doublet antennas, and the AS-2259 antenna. The CU-2064 has a rated power handling capability of 400 watts PEP or average and will tune any of the antennas listed above to a VSWR of 1.4:1 or better.

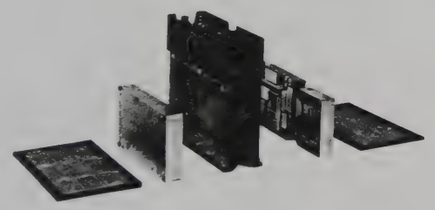
The CU-2064 is "state-of-the-art" in mechanical simplicity and operational reliability. It is fully militarized and submersible.

The CU-2064 is designed for the U.S. Marine Corps AN/MRC-138 and AN/GRC-193 Systems, but is also fully compatible with other vehicular, transportable-shelter, and fixed installations.

AM-6879 / URC

AMPLIFIER CONVERTER

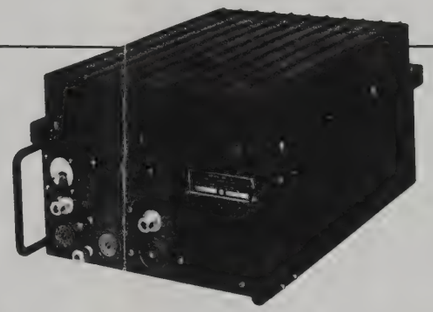


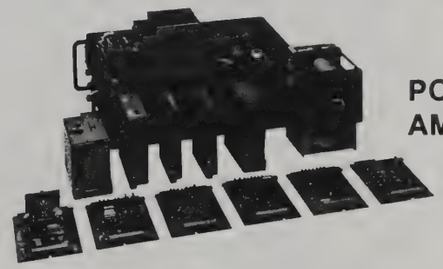


RT-1209 / URC

RECEIVER EXCITER

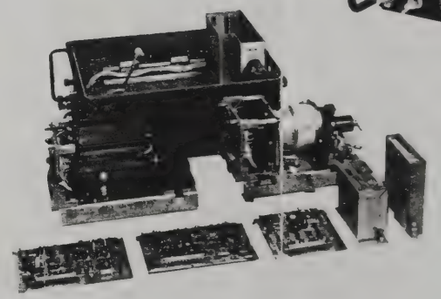
AM-6545A/ (GRC-193)





POWER AMPLIFIER

CU-2064/ (GRC-193)



ANTENNA COUPLER

SPECIFICATIONS

Frequency	2,000 to 29,999 MHz	
Channels	280,000	
Chennel Spacing	100 Hz	
Modes	USB, LSB; Voice or Data (CW, TTY) RECEIVE-TRANSMIT or RECEIVE ONLY	
RF Power Output	250 mW	
Intermodulation	-40 dB	
Receiver Sensitivity	0.7 μV for 10 dB SINAD	
Image & IF Rejection	80 dB	
Audio Output	5 mW handset, 1W speaker	
MTBF	2400 hours (specification)	
Altitude	Operational up to 10,000 feet	
Shock	3-foot drop	
Vibration	2.5 g, 5-500 Hz	
Temperature	-45°C to +71° (operating)	
Immersion	3 feet of water	
	RT-1209	AM-6879
Size	2.6H x 7.25W x 7.25D inches	5.7 H x 10.0 W x 7.00 D inches
Weight	5.8 pounds	8.5 pounds

SPECIFICATIONS

Frequency	2 to 30 MHz
RF Power Output	400W PEP or Average
RF Input	Less than 100 mV for rated output
Tuning	Automatic — less than 6 seconds
Duty Cycle	Continuous transmit at 400W average power output
Input and Output Impedance	50 ohms
Power Supply	26.5 Vdc at 40 amps maximum for 400W average output (22 to 30 volt range)
Spurious Suppression (Min)	IM: -30 dB Harmonics: -35 dB Other: 60 dB Hum & Noise: -40 dB
MTBF	1000 hours (specification)
Altitude	Operational up to 10,000 feet
Shock	20 g's, 11 msec
Vibration	2.5 's or 0.15 in. double amplitude, 5-55 Hz
Temperature	-40°C to +55°C (operating)
Immersion	3 feet of water
Size	8.0H x 11.4W x 16.4D inches
Weight	54 pounds

SPECIFICATIONS

Frequency	2 to 30 MHz
RF Power Capability	400 watts PEP or average
Tune Power	25 to 400 watts
Tuning	Automatic — less than 6 seconds
Input Impedance	50 ohms
Tuning Accuracy	1.4:1 VSWR maximum, referenced to 50 ohms
RF Duty Cycle	Continuous key-down transmit
Primary Power	26.5 Vdc: 3 amps average, 9 amps peak (22 to 30V range)
Antennas	15 and 35 foot whip, doublet AS-2259, long wire
MTBF	1000 hours (specification)
Altitude	Operational up to 10,000 feet
Shock	20 g's, 11 msec
Vibration	2.5 g's or 0.15 in. double amplitude, 5-55 Hz
Temperature	-40°C to +55°C (operating)
Immersion	3 feet of water
Size	8.0H x 11.4W x 14.8D inches
Weight	40 pounds

Figure 3. Functional Building Blocks

Table 3. Reference Publications

Title	Publication No.
Theory of Operation and Maintenance Instructions for Power Amplifier AM-6545/GRC-193	TM-87107B-34/1
Maintenance Prints for Power Amplifier AM-6545/GRC-193	TM-87107B-34/2
Rebuild Standard for Power Amplifier AM-6545/GRC-193	RS-87107B-50/3
Theory of Operation and Maintenance Instructions for Coupler Antenna CU-2064/GRC-193	TM-87117B-34/1
Maintenance Prints for Coupler, Antenna CU-2064/GRC-193	TM-87117B-34/2
Rebuild Standard for Coupler, Antenna CU-2064/GRC-193	RS-87117B-50/3
Operation and Organizational Maintenance Instructions for Radio Set AN/PRC-104	TM-07748A-12/1
Field and Depot Maintenance Instructions for Radio Set AN/PRC-104	TM-07748A-45/2
Maintenance Prints for Radio Set AN/PRC-104	TM-07748A-45/3
Rebuild Standard for Radio Set AN/PRC-104	RS-07748A-50/4
Operation and Organizational Maintenance Instructions for Amplifier-Converter AM-6879/URC	TM-07749A/07743A-12/2
Amplifier-Converter AM-6879/URC Field Maintenance	TM-07749A/07743A-40/3
Maintenance Prints for Amplifier-Converter AM-6879/URC	TM-07749A/07743A-40/4
Rebuild Standard for Amplifier-Converter AM-6879/URC	RS-07749A/07743A-50/5
Theory of Operation and Maintenance Instructions for Power Supply PP-7733D	TM-08077A-15

SECTION A

AN/GRC-193A
EQUIPMENT CONFIGURATIONS

Item	Nomenclature	Description	Drwg. No.	MIL Spec No.	Test Spec No.	NSN	Supplier	Notes
A	AN/GRC-193A	Radio Set	755017B0900		755017A1010-1	5820-01-133-41295	Harris	(1)
1	MT-6232/GRC-193	Mount, Electrical Equipment	755017B0700		NA		Harris	
2	AM-6545A/GRC-193	Amplifier, Radio Frequency	755017B3000	MIL-A-289880(MC)	755017A3000-4&-5	5820-01-050-5881	Harris	(3)
3	CU-2064/GRC-193	Coupler, Antenna	755017A8000	MIL-C-289898(MC)	755017A8000-1&-5	5985-01-050-4869	Harris	
4	RT-1209/URC	Receiver-Transmitter	755002A0150	ELEX-136A add 4	755002A0152	5820-01-069-2368	HAC	
5	AM-6879/URC	Amplifier-Converter	755002A1800	P/O N00039-74-C-0357	755002A1860	5820-01-070-1950	HAC	
6		W1 Cable Assy	755002A1810	NA	NA	5995-01-070-6621	HAC	
7		W2 Cable Assy	755002A1811 Rev B	NA	NA	5820-01-070-2362	HAC	
8	KY-872/PRC-104	CW Key	755002A1000			5805-01-067-5388	HAC	
9	H-189/GR	Handset	SC-DL-544225	MIL-H-55258(EL)		5965-00-069-8886	GFM	(2)
10		Syst. Manual	6911-0720	NA	NA	NA	Harris	
B	M151A2 Installation Kit		755017B-0775	NA	NA		Harris	

(1) Identical to AN/GRC-193 (drwg no 755017A1010, NSN 5820-01-067-8359) except MT-6232/GRC-193 used instead of MT-6014/GRC-193. Equipment complement - Items 1 thru 10 (major components)

(2) or H-250/U

(3) includes 400 - 100 W switch

Table 4. AN/GRC-193(A) - for Wheeled Vehicle & Base Installations, Equipment Complement (major components) & List of Applicable Documents (Ref. p. 9 for detailed parts list)

Item No.	Qty. per Assy	Part Number	Specification	Nomenclature or Description
1	1	755002A0150	ELEX-R-136A	Receiver-Transmitter RT-1209/URC
2	1	755002A1800	ELEX-R-136A	Amplifier Converter AM-6879/URC
3	1	755017B3000	MIL-A-28988	Amplifier, Power AM-6545
4	1	755017A8000	MIL-C-28989	Coupler, Antenna CU-2064
5	1	755017B0661		Control Group, Radio Set AN/GRA-39C
6	1	AS-2259/GR		Antenna, NVIS
7	1	AN/GRA-50		Antenna Group
8	1	H-250	MIL-H-49078	Handset
9	1	755002A1000	ELEX-R-136A	Key, Telegraph KY-872
10	1	755017B0771		Kit, Antenna Siting

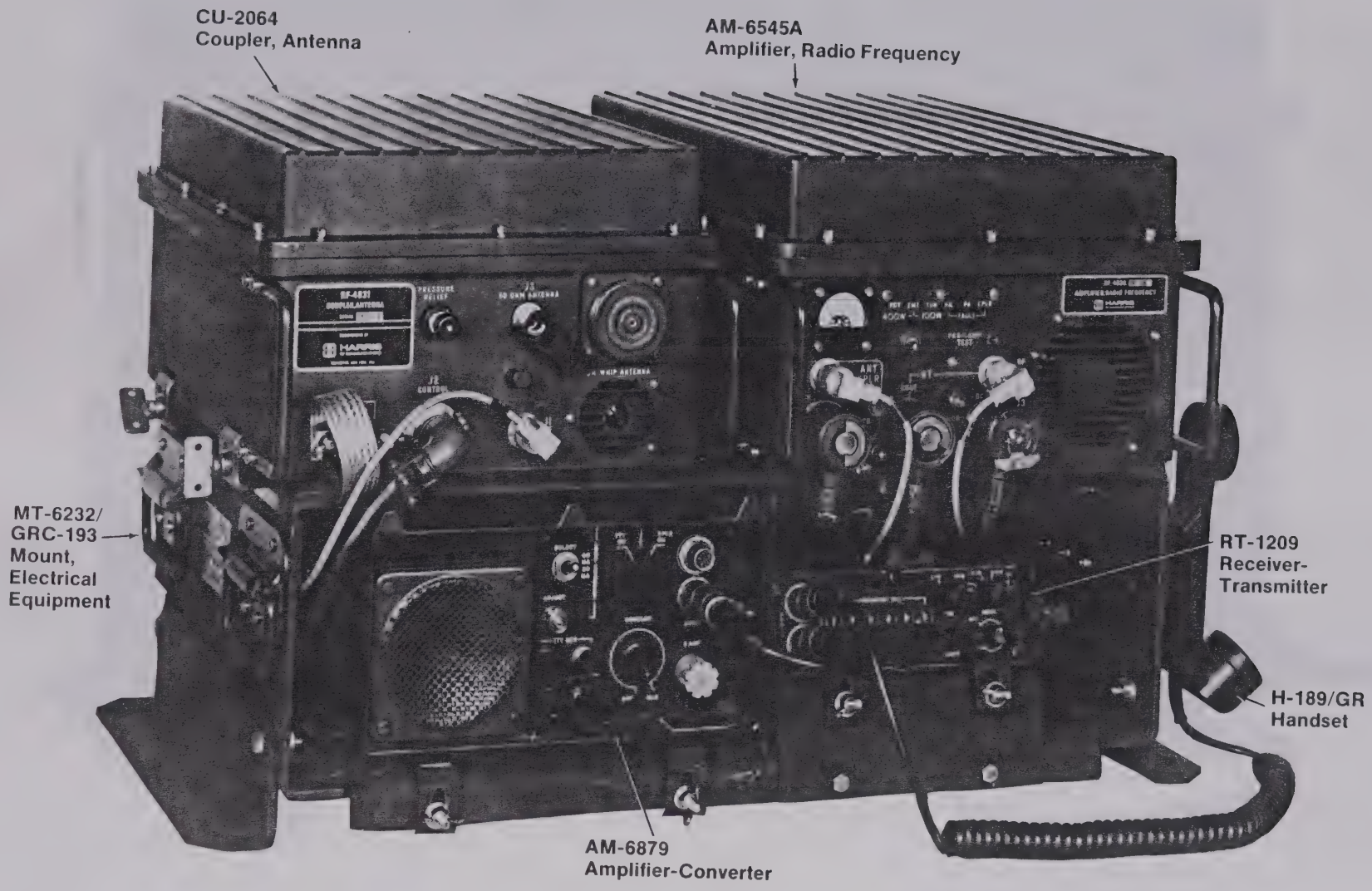
(Note: Items 1, 2, & 8 are GFM)

Table 5. AN/GRC-193A (Basic Unit) Parts List

Item No.	Qty. per Assy	Part Number	Specification	Nomenclature or Description
1	1	755017B0700		MT-6232/GRC-193A Mounting Base
2	1	755017B0775		MT-6232/GRC-193A Installation Kit
3	1	AB-652		Mast Base, Antenna
4	3	MS-116	MIL-M-12320	Mast Section, Antenna
5	1	MS-117	MIL-M-12320	Mast Section, Antenna
6	1	MS-118	MIL-M-12320	Mast Section, Antenna
7	1	SC-C-446046		Antenna Tip Assy
8	1	SM-D-500428		Antenna Sheath
9	1	SC-C-446008		Antenna Guard Assy
10	1	SC-B-19491		Clamp
11	40	SM-B-500418		Rope, 2 x 20 ft. long
12	1	755017B0765		Antenna Adapter
13	1	755017B0912		Installation Instruction

(Note: Item 1 is GFM)

Table 6. MK-2461/GRC-193A, M151A1 Installation Kit Parts List



Dimensions: inches - 15.25H x 23.5W x 16.1D
cm - 38.7H x 59.7W x 40.9D

Weight: 150 lb (68kg)

Figure 4. AN/GRC-193A Radio Set, Front View

Figure 5. AN/GRC-193A Radio Set, Rear View

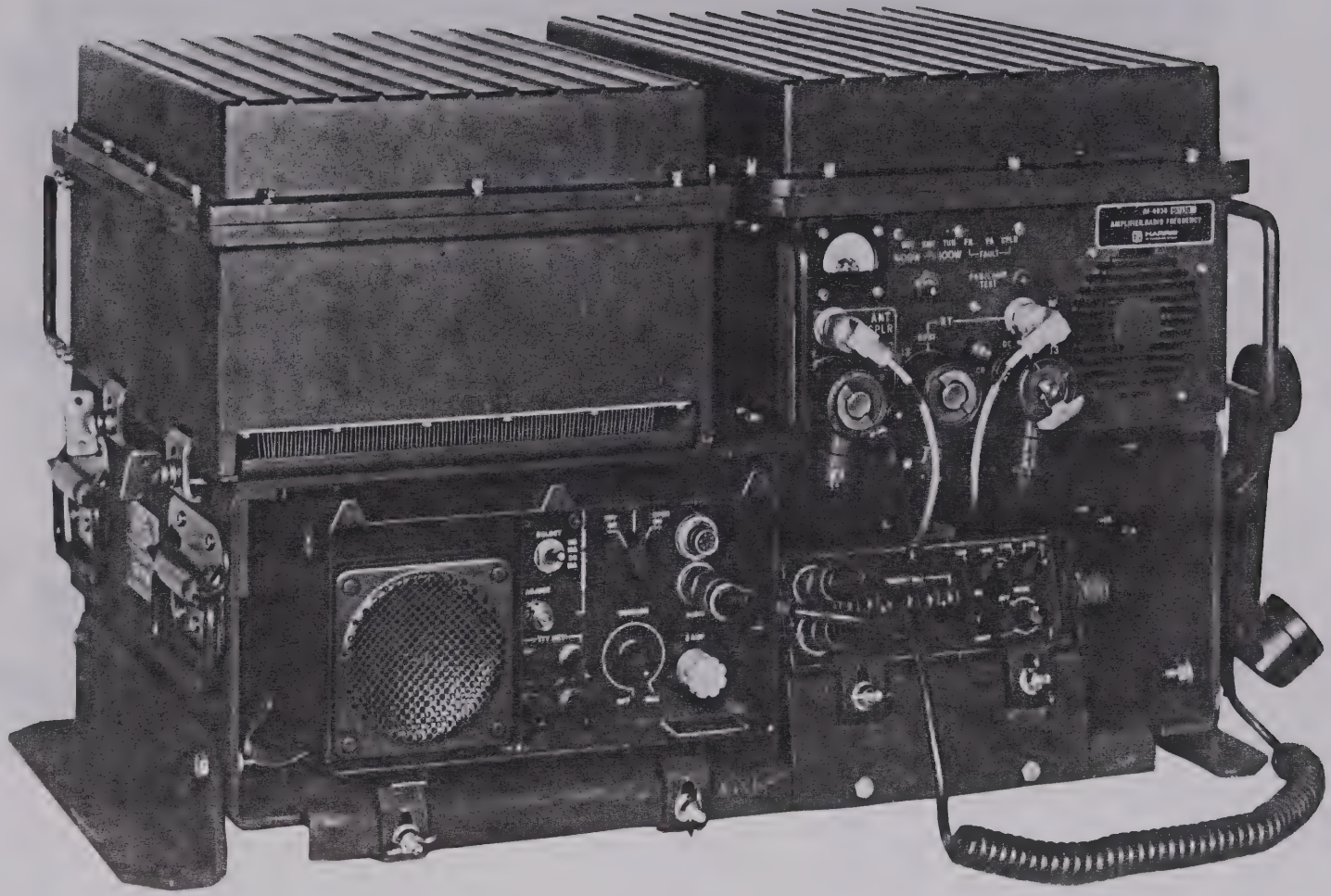


Figure 6. AN/GRC-193A Radio Set, CU-2064 Reverse-mounted, Front View

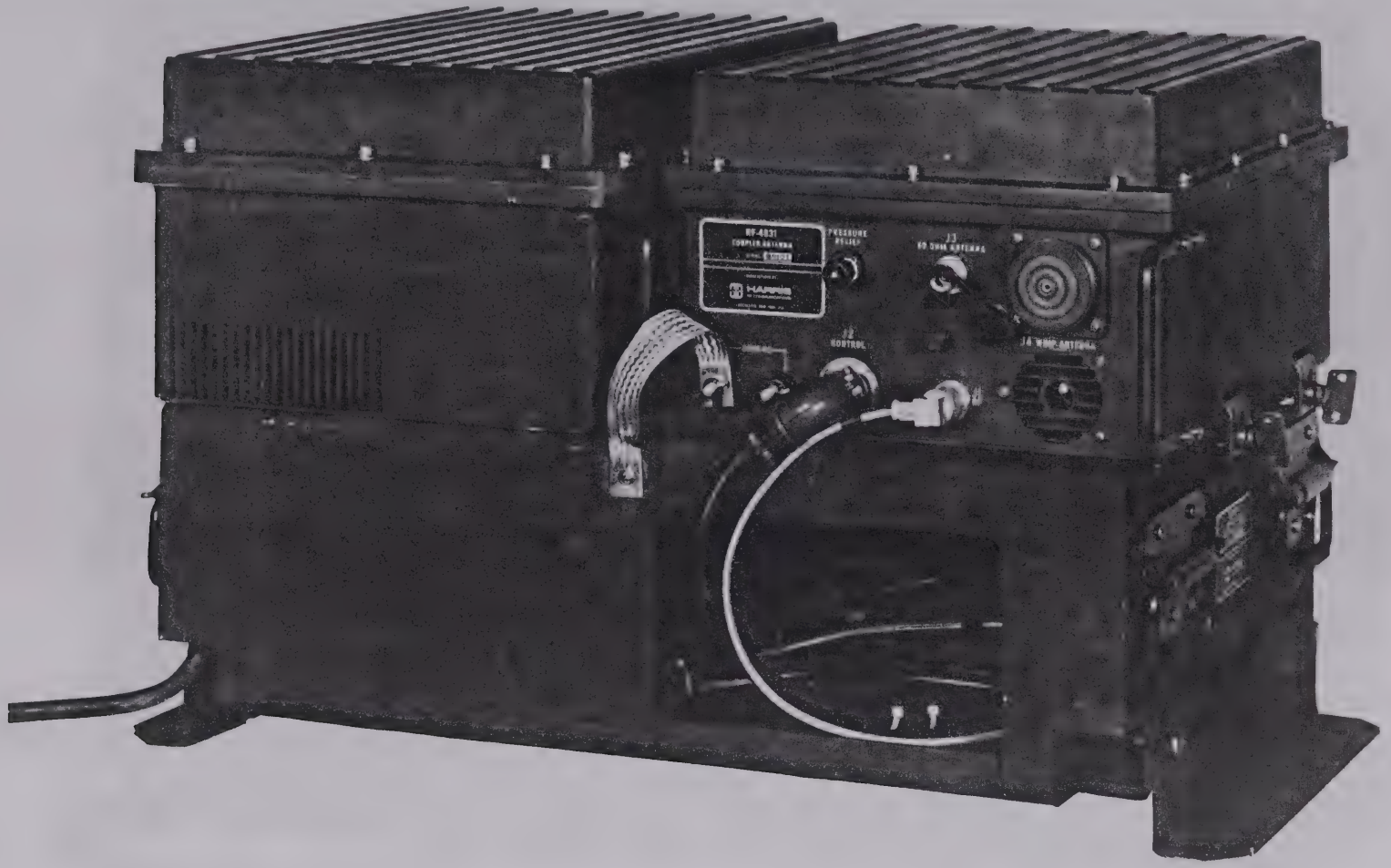


Figure 7. AN/GRC-193A Radio Set, CU-2064 Reverse-mounted, Rear View

Item	Nomenclature	Description	Drwg. No.	MIL Spec No.	Test Spec No.	NSN	Supplier	Notes
A	AN/GRC-193A	Radio Set	755017B0900		755017A1010-1	5820-01-133-41295	Harris	(1)
1	MT-6233/GRC-193	Mount, Electrical Equipment	755017B0759		NA	NA	Harris	(4)
2	AM-6545A/GRC-193	Amplifier, Radio Frequency	755017B3000	MIL-A-28988B(MC)	755017A3000-4&-5	5820-01-050-5881	Harris	(3)
3	CU-2064/GRC-193	Coupler, Antenna	755017A8000	MIL-C-28989B(MC)	755017A8000-1&-5	5985-01-050-4869	Harris	
4	RT-1209.URC	Receiver-Transmitter	755002A0150	ELEX-136A add 4	755002A0152	5820-01-069-2368	HAC	
5	AM-6879/URC	Amplifier-Converter	755002A1800	P/O N00039-74-C-0357	755002A1860	5820-01-070-1950	HAC	
6	KY-872/PRC-104	CW Key	755002A1000			5805-01-067-5388	HAC	
7	H-189/GR	Handset	SC-DL-544225	MIL-H-55258(EL)		5965-00-069-8886	GFM	(2)
8		System Manual	6911-0720	NA	NA	NA	Harris	

(1) Identical to AN/GRC-193 (Drwg no 755017A1010, NSN 5820-01-067-8359) except MT-6233/GRC-193 used instead of MT-6014/GRC-193. Equipment complement - Items 1 thru 8 (major components)

(2) or H-250/U

(3) includes 400 - 100 W switch

(4) includes all required installation material

Table 7. AN/GRC-193A - for M113A1 & M577A1 APC Installations - Equipment Complement (major components) & List of Applicable Documents (Ref. p. 15 for detailed parts list)

Item No.	Qty. per Assy	Part Number	Specification	Nomenclature or Description
1	1	755002A0150	ELEX-R-136A	Receiver-Transmitter RT-1209/URC
2	1	755002A1800	ELEX-R-136A	Amplifier Converter AM-6879/URC
3	1	755017B3000	MIL-A-28988	Amplifier, Power AM-6545
4	1	755017A8000	MIL-C-28989	Coupler, Antenna CU-2064
5	1	755017B0661		Control Group, Radio Set AN/GRA-39C
6	1	AS-2259/GR		Antenna, NVIS
7	1	AN/GRA-50		Antenna Group
8	1	H-250	MIL-H-49078	Handset
9	1	755002A1000	ELEX-R-136A	Key, Telegraph KY-872
10	1	755017B0771		Kit, Antenna Siting

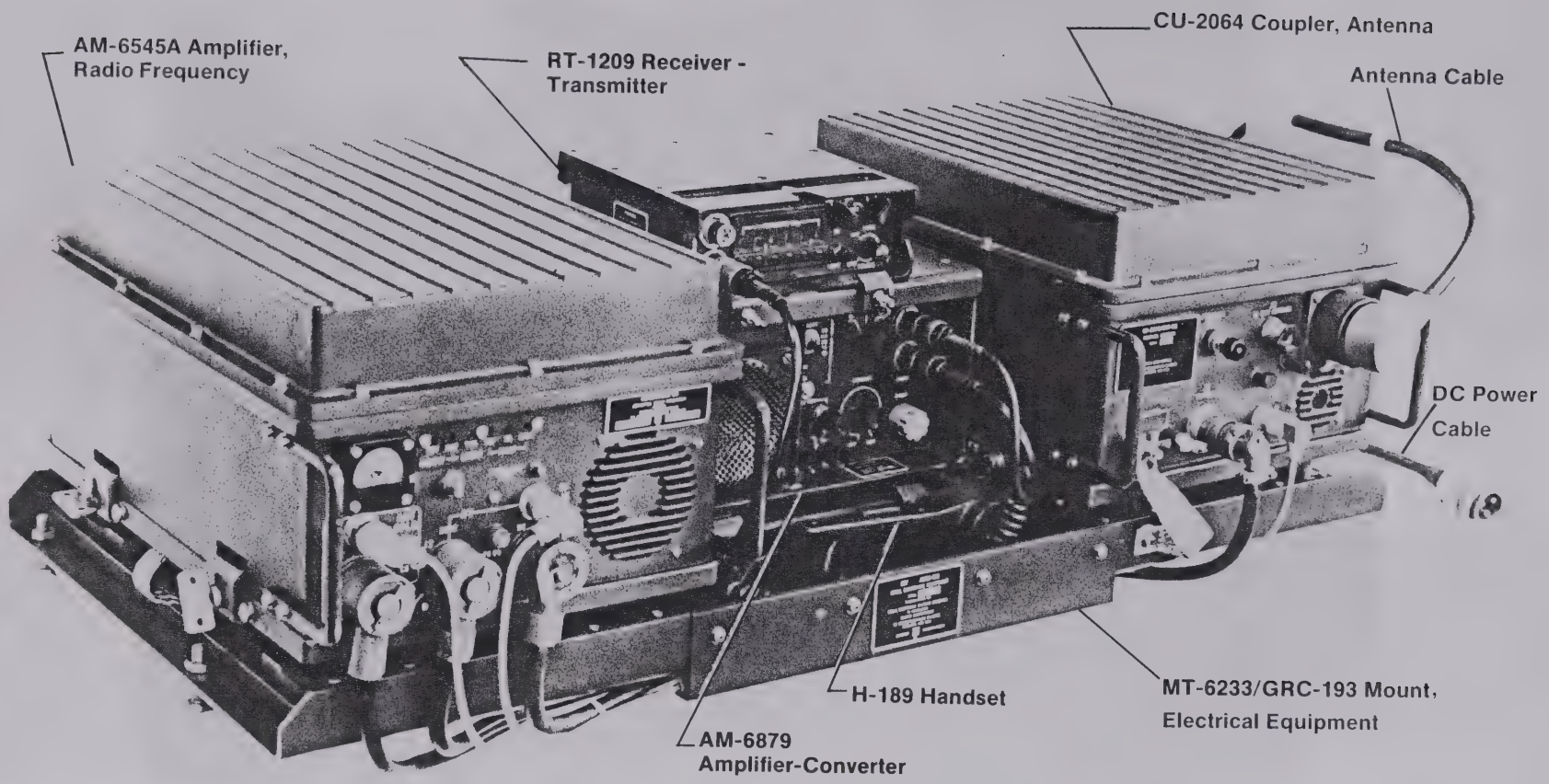
(Note: Items 1, 2, & 8 are GFM)

Table 8. AN/GRC-193A (Basic Unit) Parts List

Item No.	Qty. per Assy	Part Number	Specification	Nomenclature or Description
1	1	755017B0759		MT-6233/GRC-193A Mounting Base
2	1	AB-652		Mast Base, Antenna
3	3	MS-116	MIL-M-12320	Mast Section, Antenna
4	1	MS-117	MIL-M-12320	Mast Section, Antenna
5	1	MS-118	MIL-M-12320	Mast Section, Antenna
6	1	SC-C-446046		Antenna Tip Assy
7	1	SM-D-500428		Antenna Sheath
8	1	SC-C-49639		Adapter
9	1	SC-B-19491		Clamp
10	40	SM-B-500418		Rope, 2 x 20 ft. long
11	1	755017B0772		Intercom Cable Assy
12	1	755017B0765		Antenna Adapter
13	1	755017B0927		Installation Instruction
14	4	MS35338-141	FF-W-84	Washer, Lock 3/8
15	4	MS35338-140	FF-W-84	Washer, Lock 5/16
16	4	MS35307-362	FF-W-85	Bolt, 3/8-16 x 1¼ lg
17	4	MS35307-341	FF-W-85	Bolt, 5/16-18 x 2¼ lg

(Note: Item 2 is GFM)

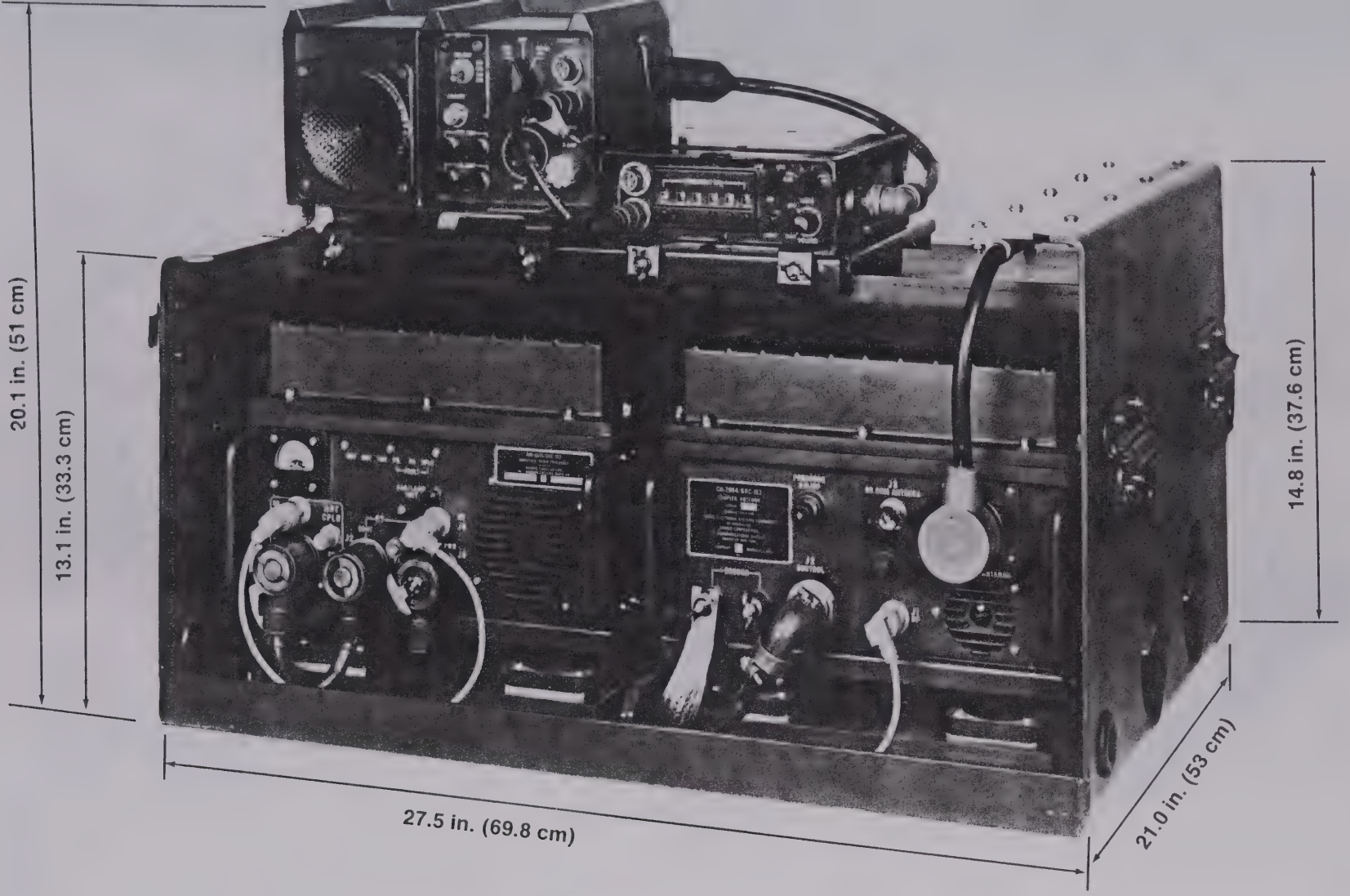
Table 9. MK-2460/GRC-193A, M113A1/M577A1 Installation Kit Parts List



Dimensions: inches - 37.0W x 11.0H x 18.0D
cm - 94.0W x 28.0H x 45.7D

Weight: 166 lb (75.5kg)

Figure 8. AN/GRC-193A Radio Set for M113A1 and M577A1 APC Installation, Front View



Weight = 195 lbs. (88.6 kg)

Figure 9. AN/GRC-193 "Minirack" Installation, Front View

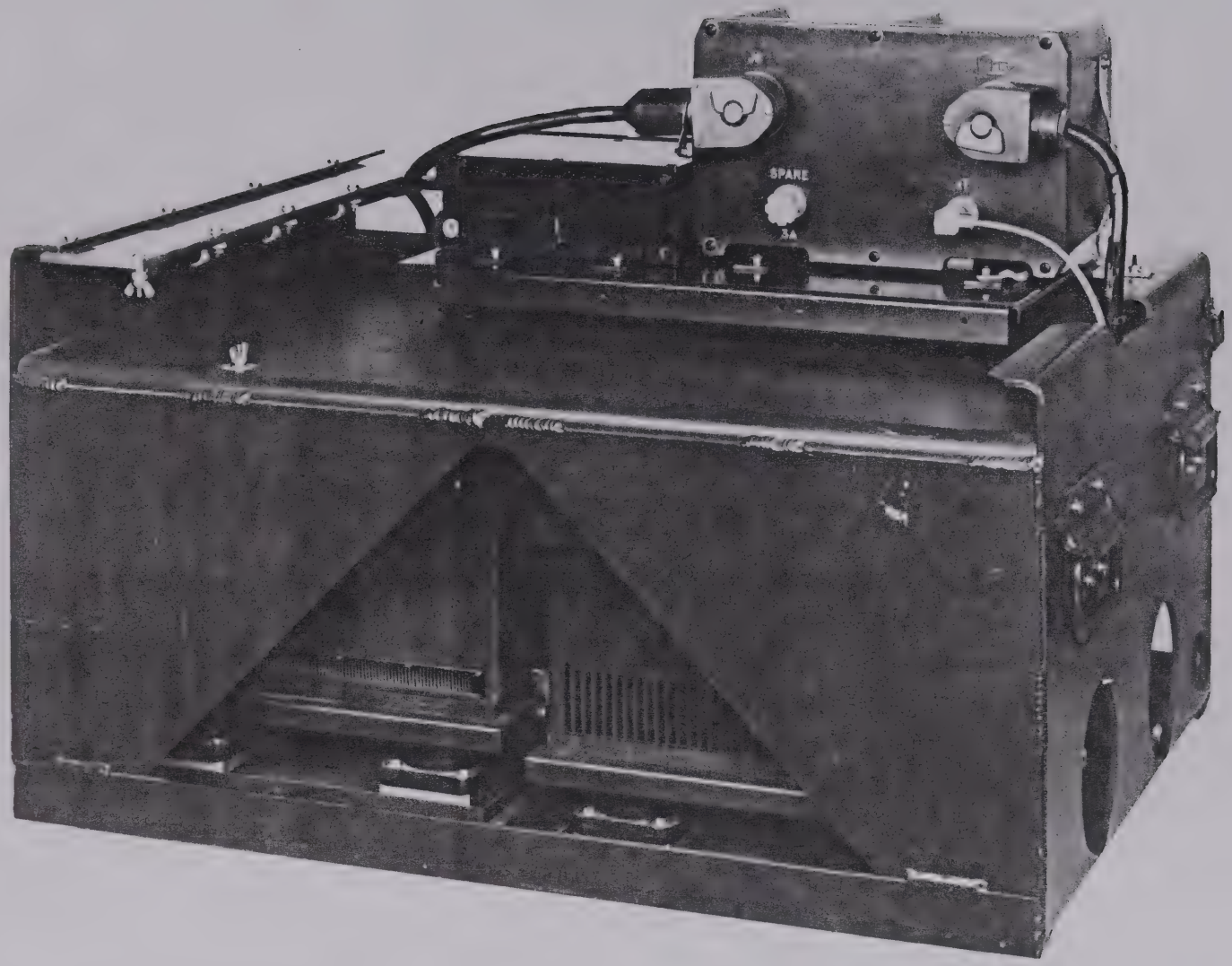


Figure 10. AN/GRC-193 "Minirack" Installation, Rear View

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SECTION B

AN/GRC-193A SYSTEMS/INSTALLATION

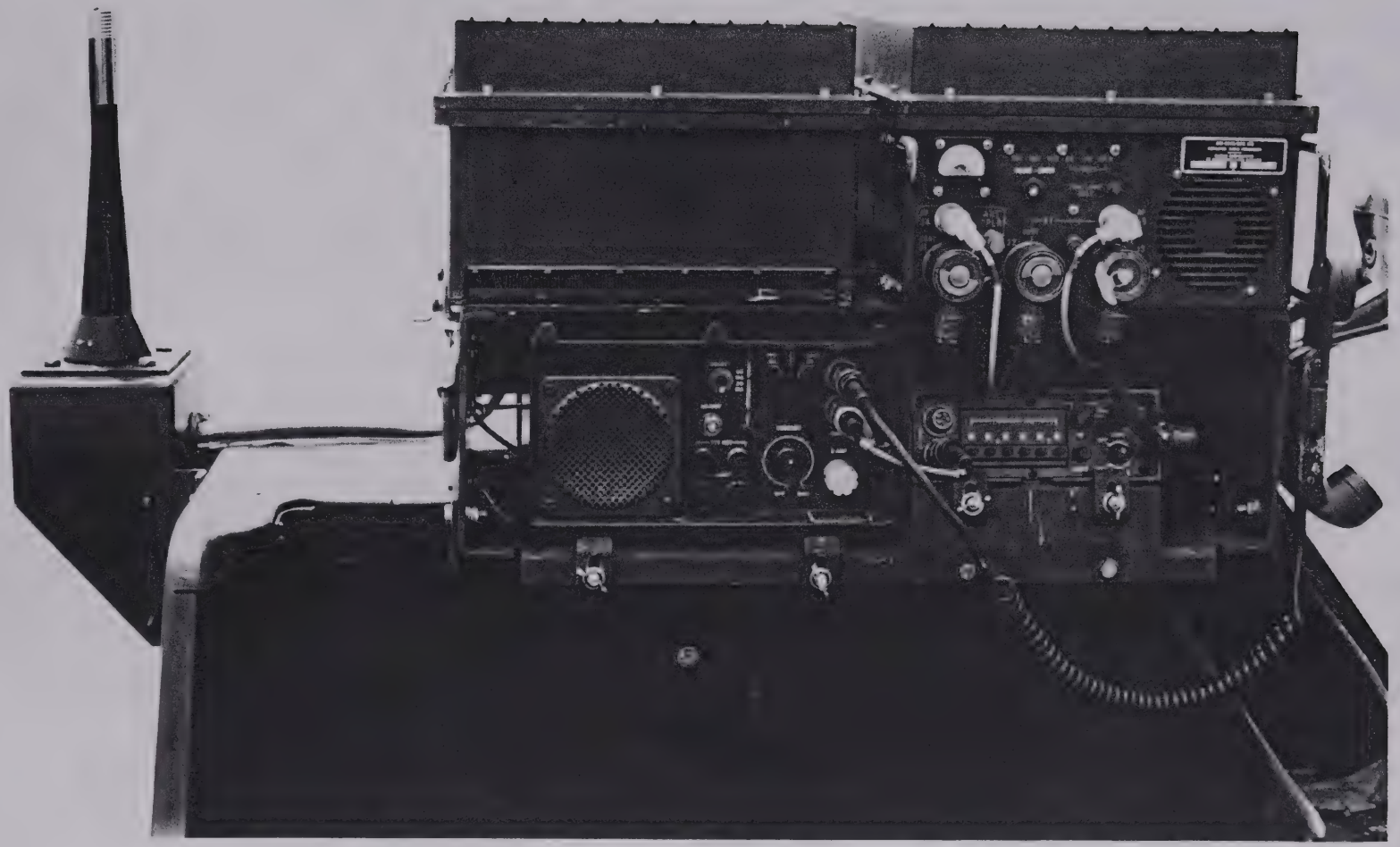


Figure 11. AN/GRC-193A Radio Set, Installed in the M151A2 1/4 Ton Truck

Figure 12. AN/GRC-193A Radio Set, Installed in the M151A2 1/4 Ton Truck

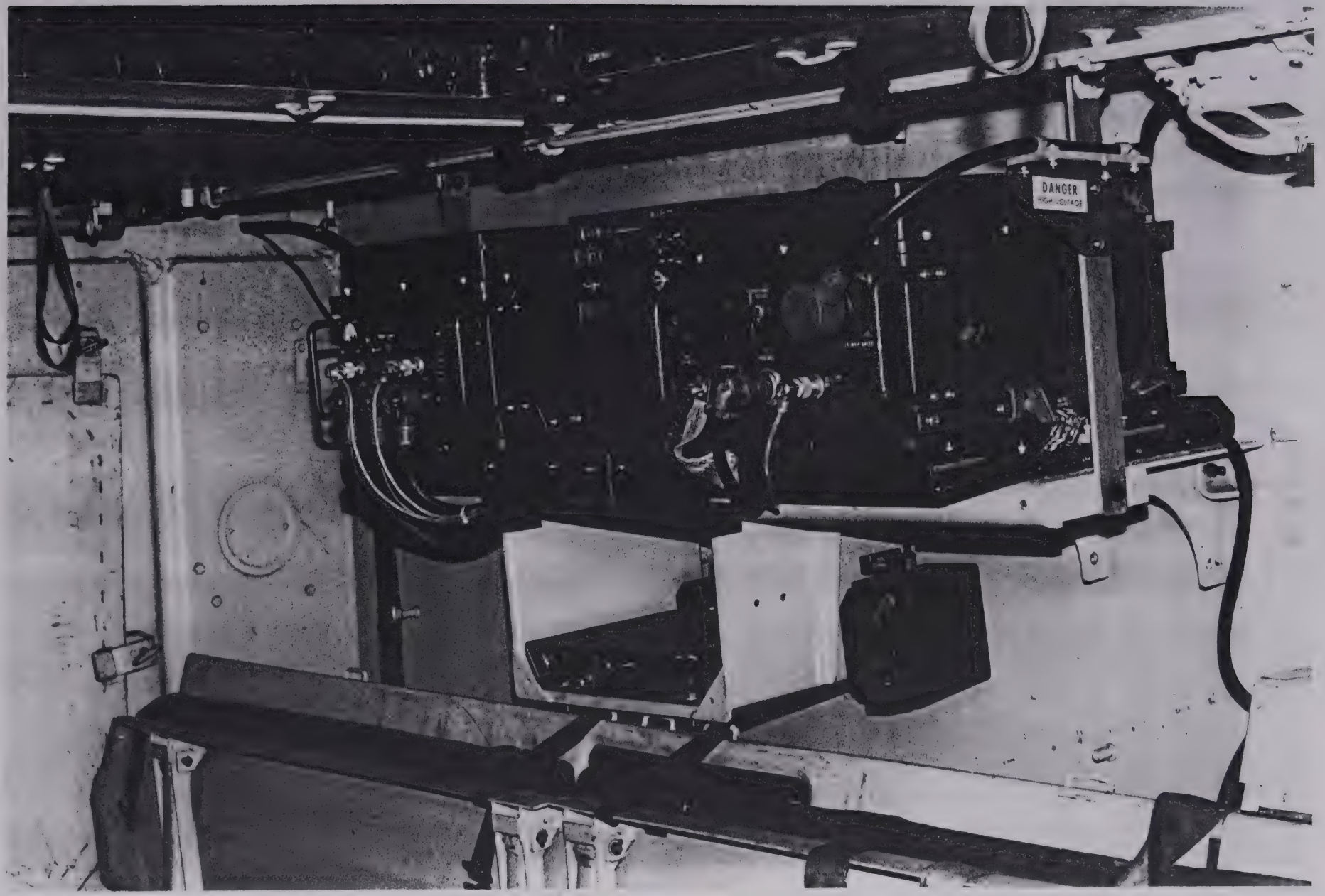


Figure 13. AN/GRC-193A Radio Set, Installed in the M113A1 Armored Personnel Carrier

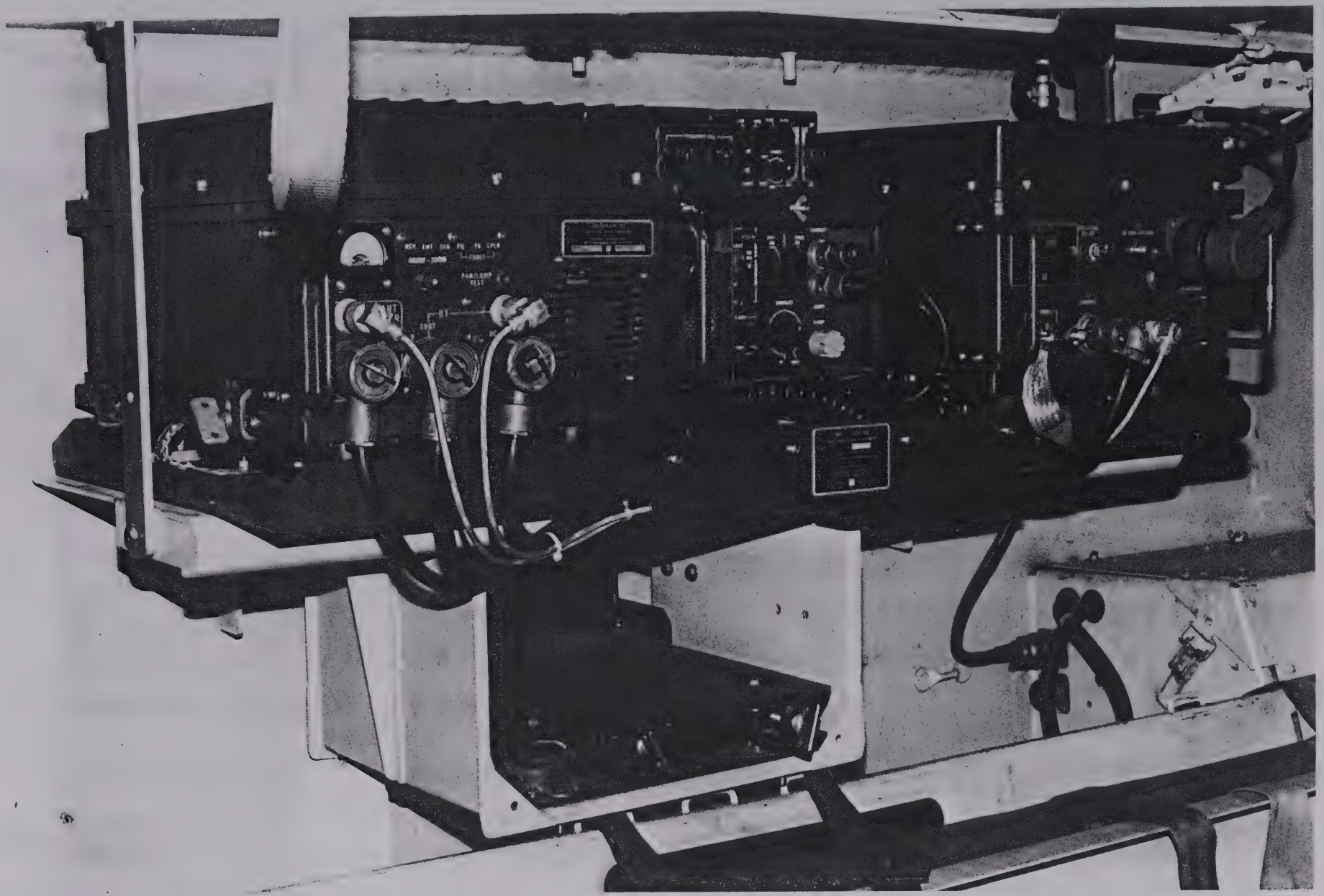


Figure 14. AN/GRC-193A Radio Set, Installed in the M113A1 Armored Personnel Carrier

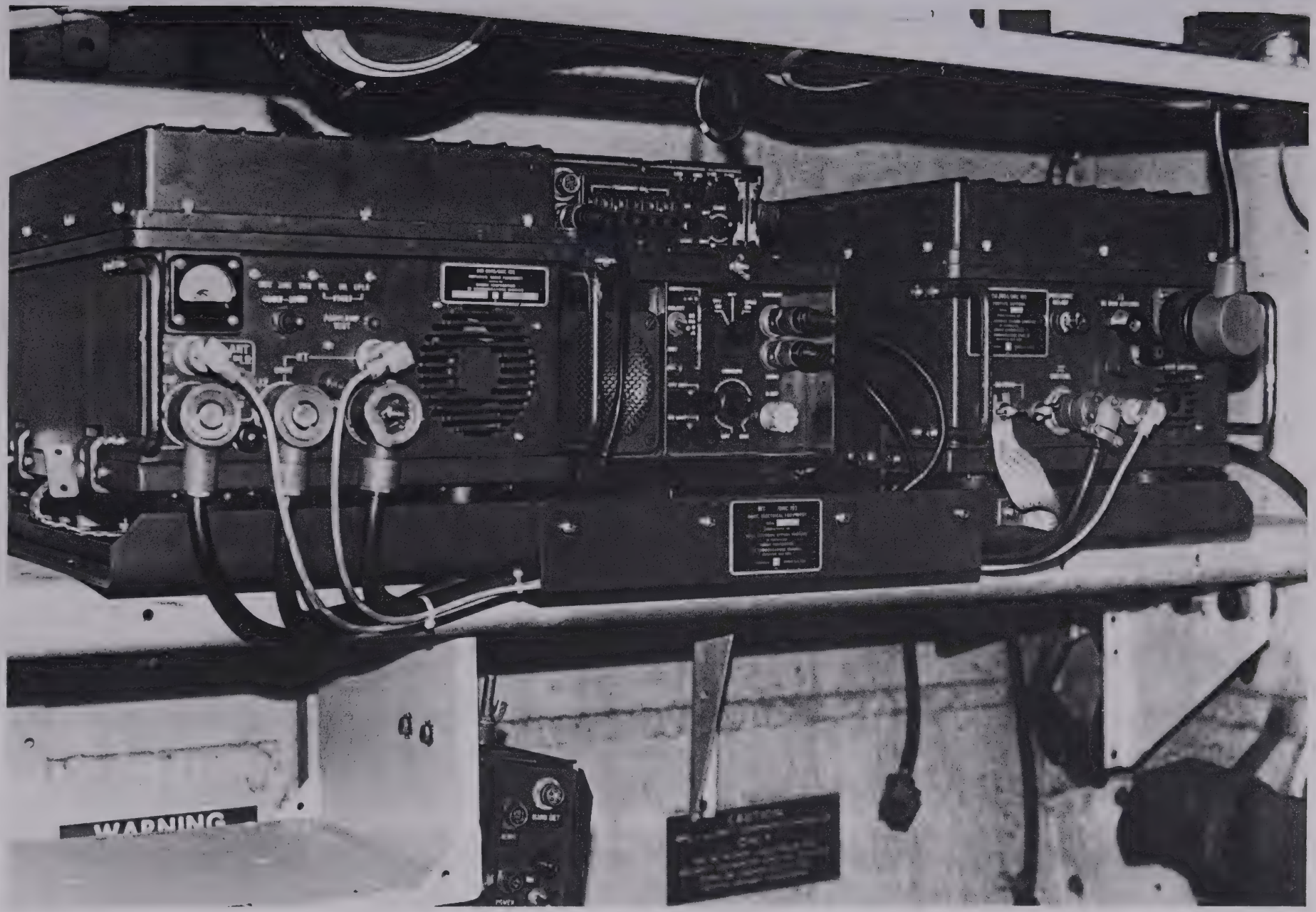


Figure 15. AN/GRC-193A Radio Set, Installed in the M577A1 Armored Command Post

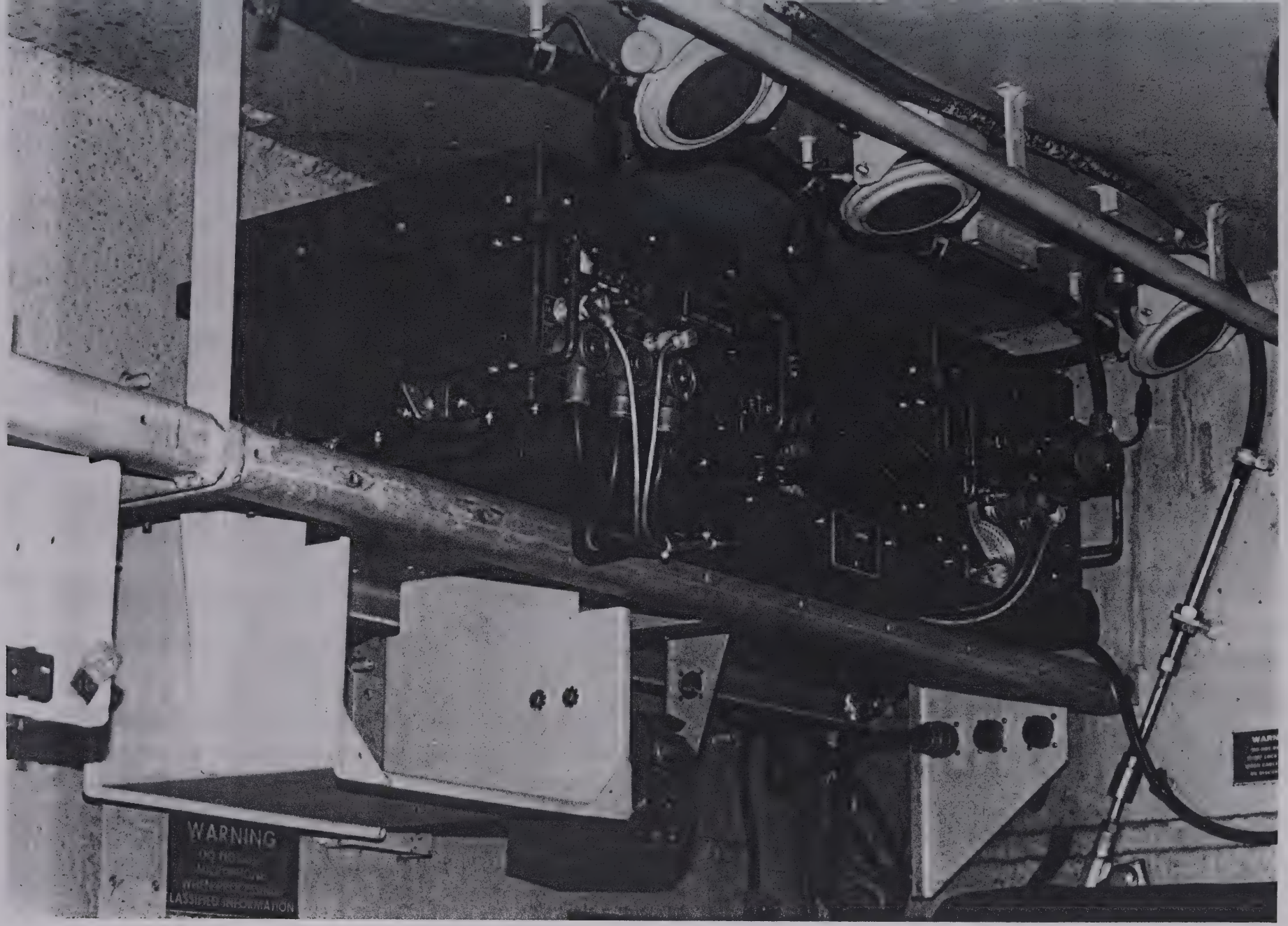


Figure 16. AN/GRC-193A Radio Set, Installed in the M577A1 Armored Command Post

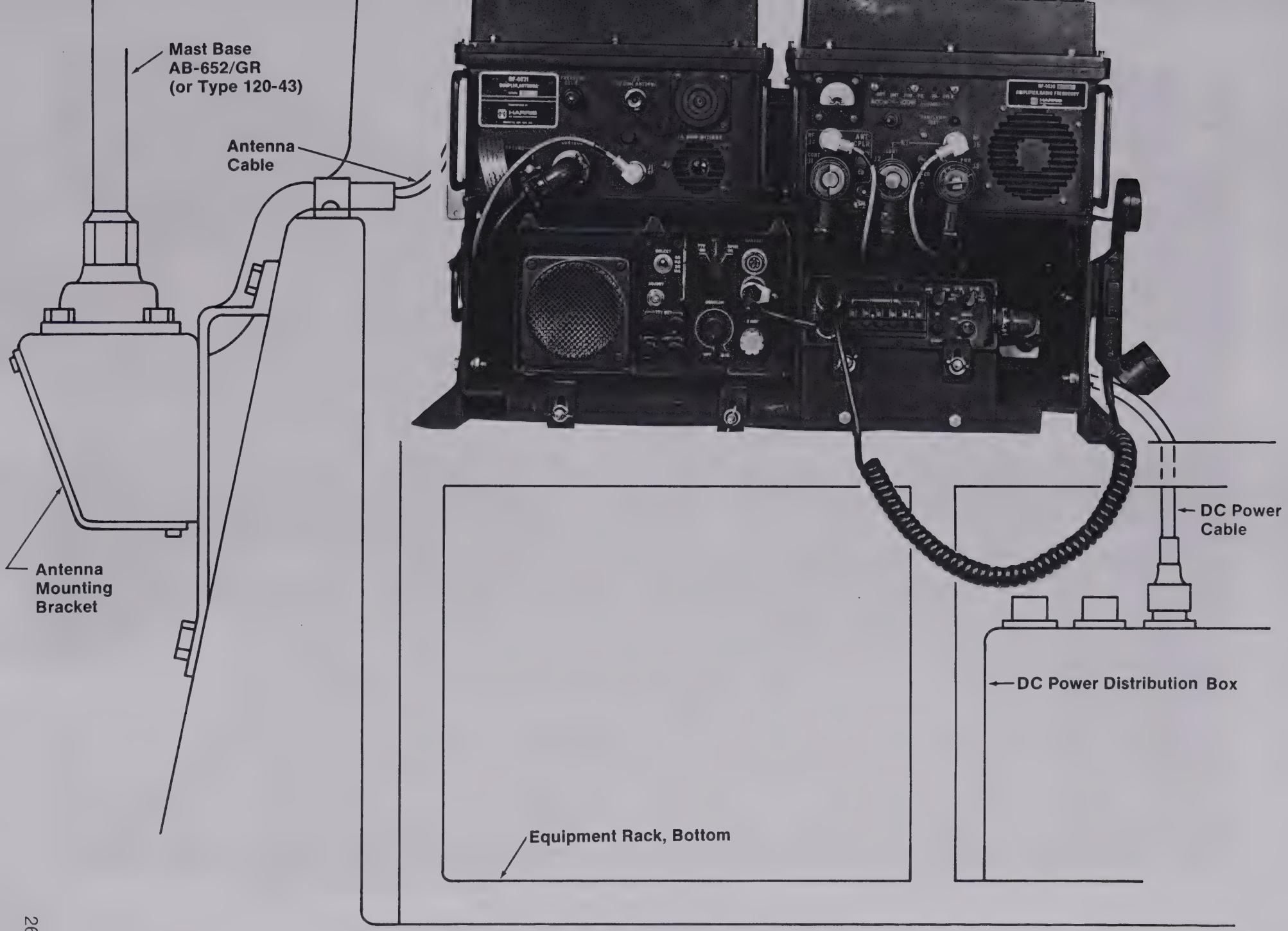


Figure 17. AN/GRC-193A Radio Set, Installed in M882/M884 Truck or CUCV

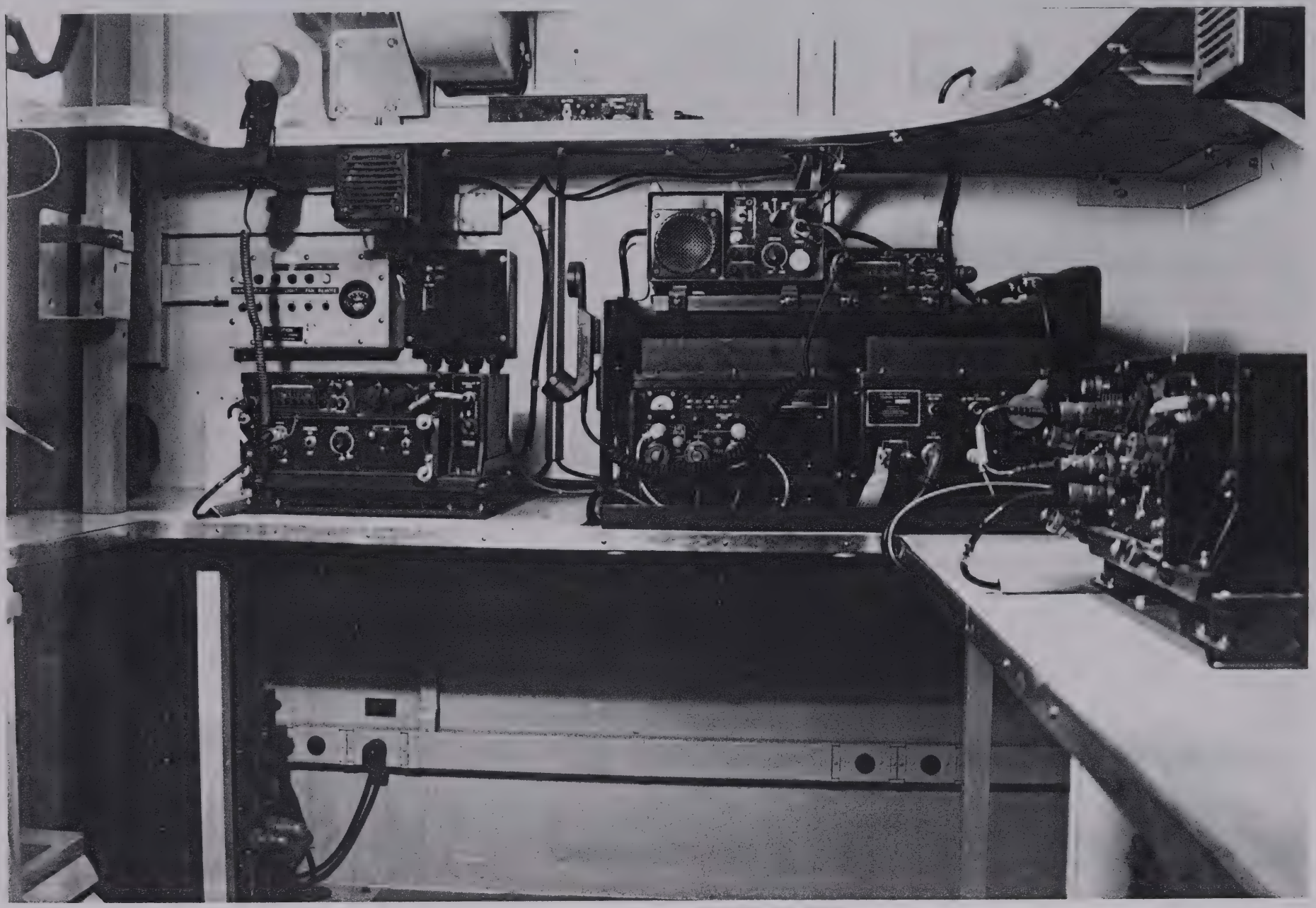


Figure 18. AN/TRC-184 Shelter System

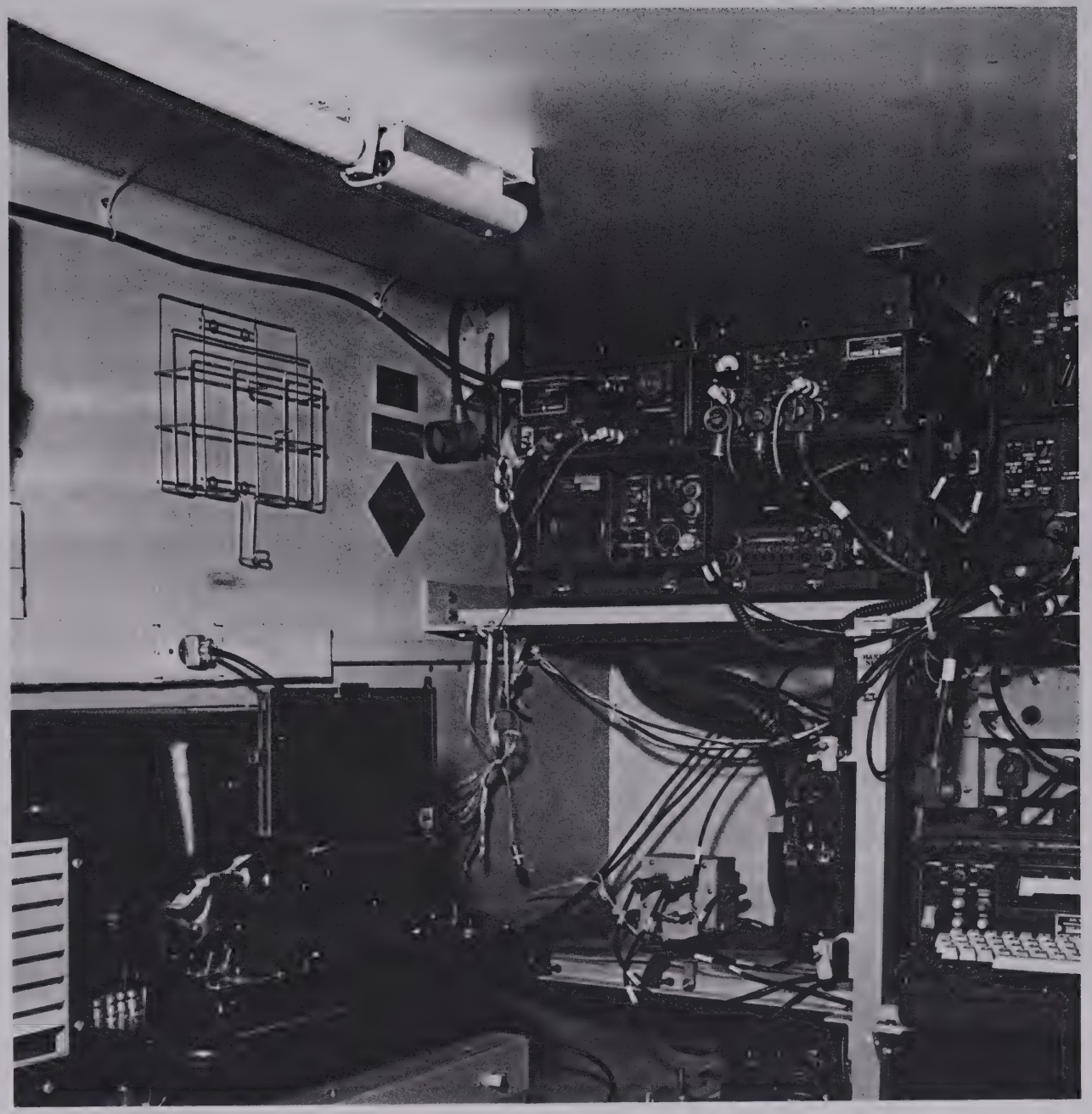


Figure 19. AN/GRC-193A Installation in AN/GRC-122E

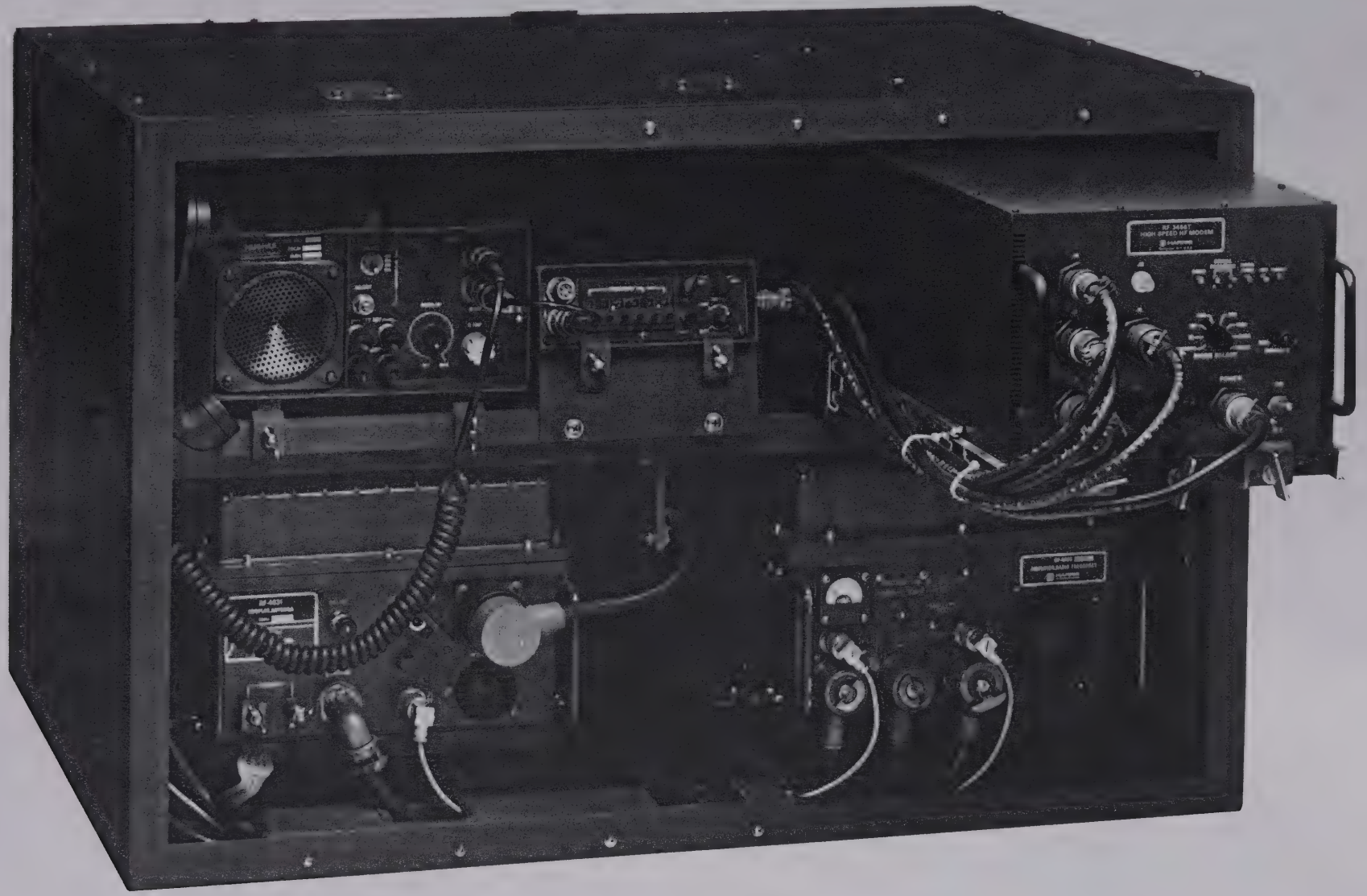


Figure 20. AN/GRC-193A Pallet with RF-3466T High-Speed Tactical HF Data Modem

SECTION C

ANCILLARY EQUIPMENT AND ACCESSORIES

a. Deployable Tactical Antenna Siting Kit

The Tactical Antenna Siting Kit enhances the operational flexibility of the 400 W HF GRC-193 Radio Set by making it possible to remote (up to 200 feet) the CU-2064 Antenna Coupler and antenna from the radio set for:

1. Optimum siting of the antenna at an elevated clear area.
2. Concealment and/or protection of the operator and the radio set.
3. Separation of antennas at a communications complex for minimum interference between many collocated radio sets.

The kit consists of:

- 200 feet long control and rf cables stored on the RC-435/U reel. All connectors are provided with protective caps.
- The MT-6378/GRC-193 Mounting Base, Electrical Equipment that provides a mounting platform with quick fastening (2 thumbscrew-clamps) for the CU-2064 Antenna Coupler and the antenna base-insulator. The base-insulator can be folded down for storage to minimize overall size of the mount.
- An optional adapter (MX-10618) permits the whip or other antennas to be replaced with the Near Vertical Incidence Skywave (NVIS) antenna AS-2259.

NOTES: 1. Remoting farther than 200 feet is possible by selecting a lower loss rf cable, provided that the increase in bulk and weight of the remoting cables and the need for separate reels for control and rf cables is acceptable.

2. The effectiveness of the antenna used (particularly whips) can be improved by the use of ground rods and radials.

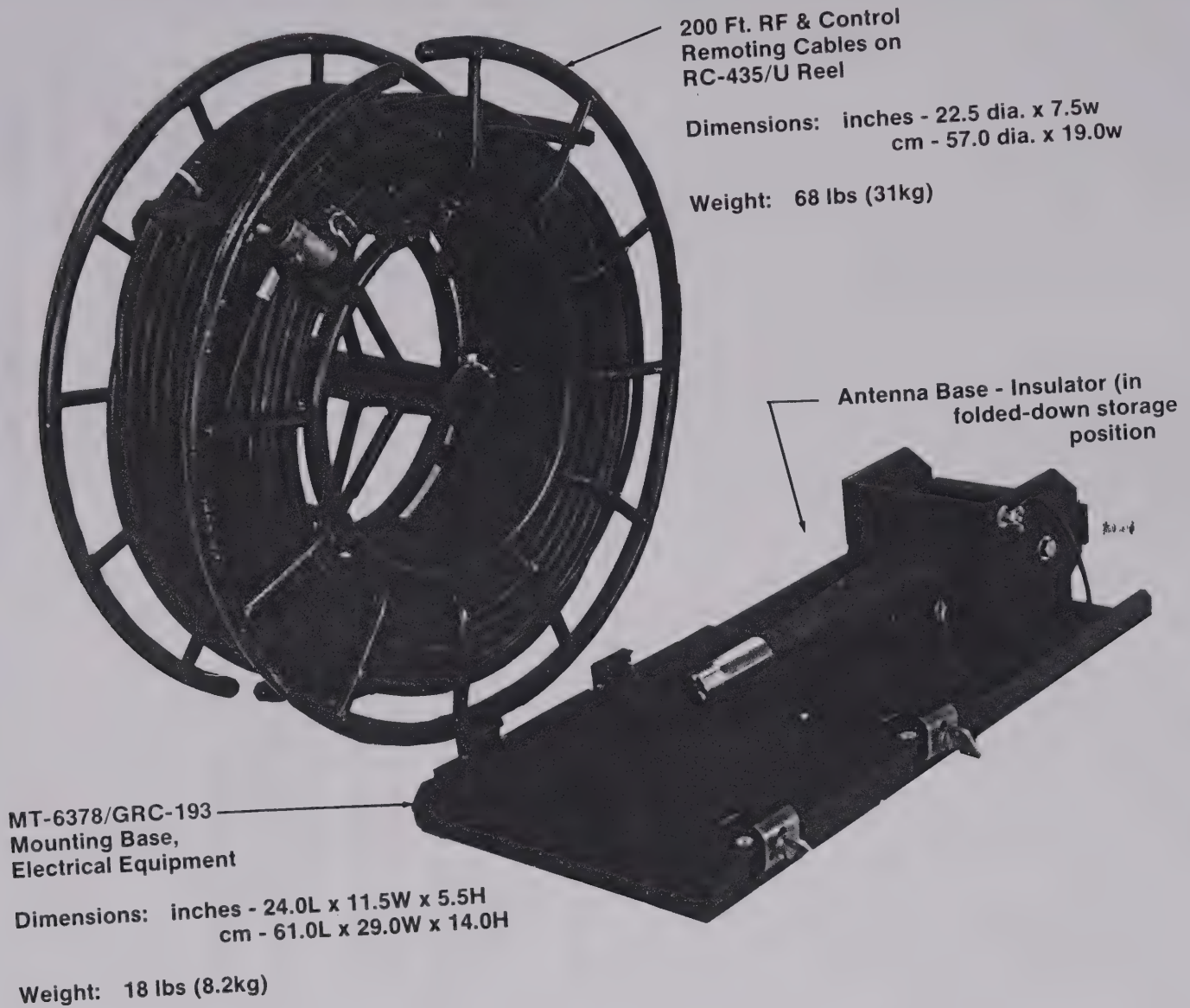


Figure 21. Tactical Antenna Siting Kit

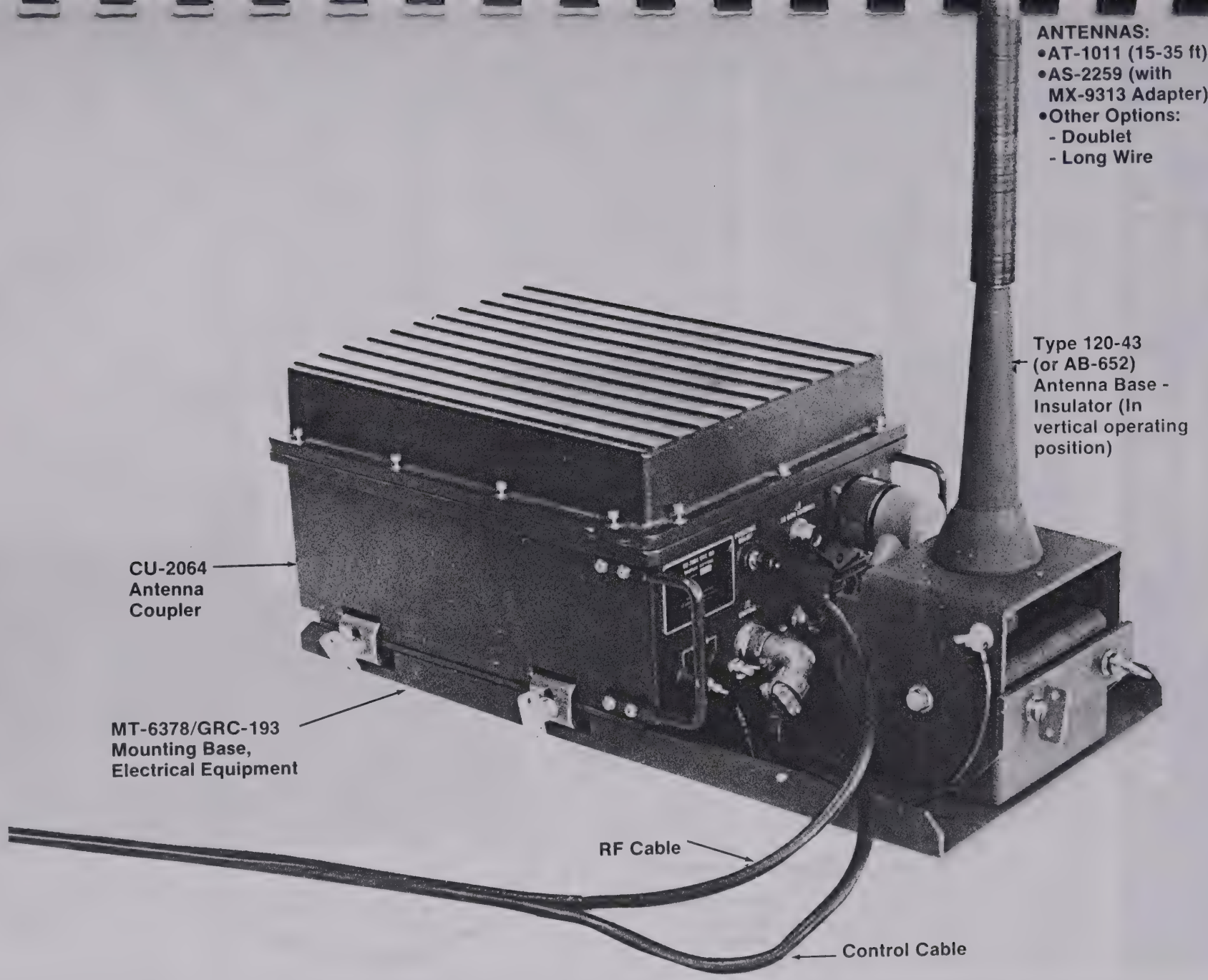


Figure 22. CU-2064 Installed in MT-6378/GRC-193A

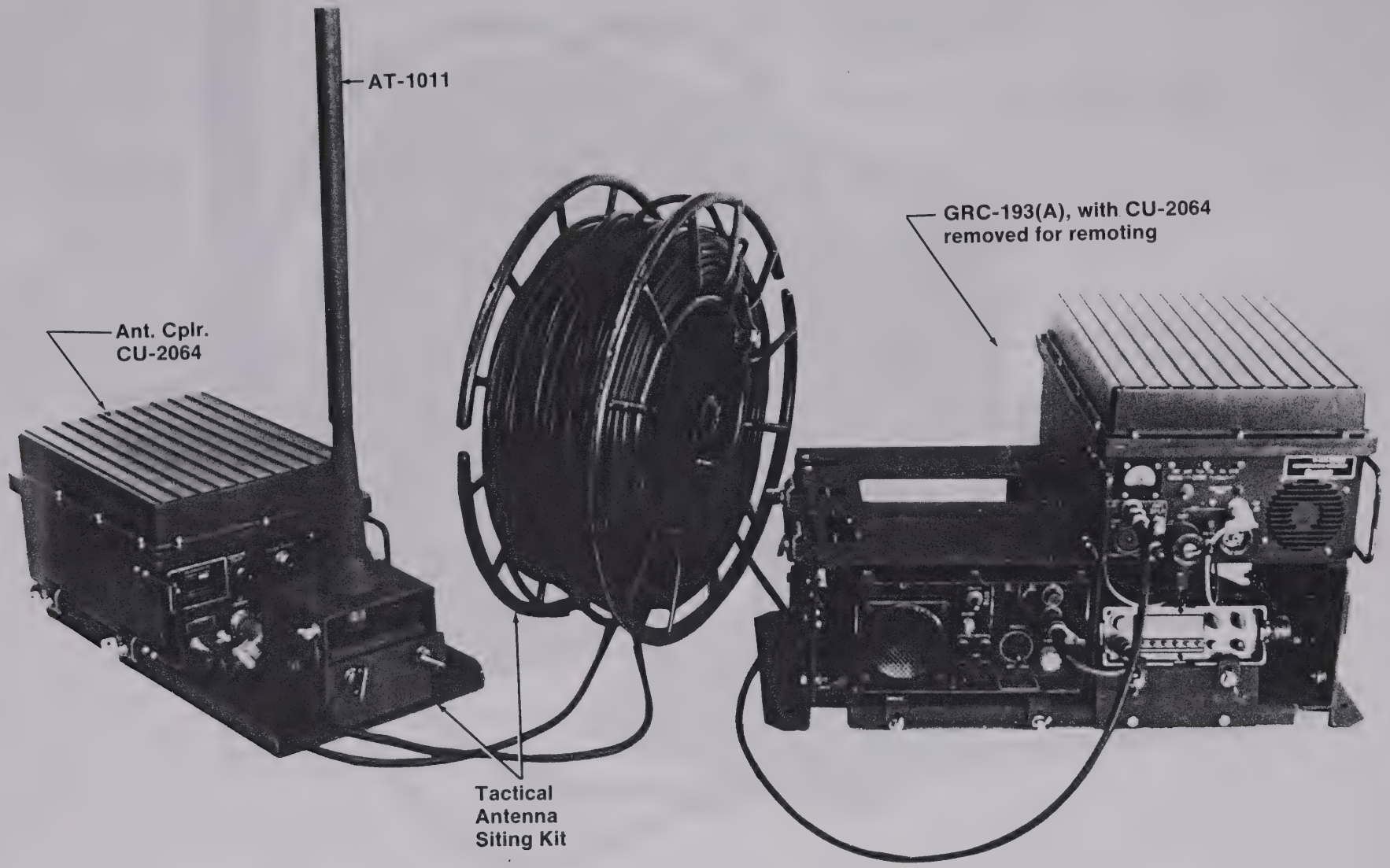
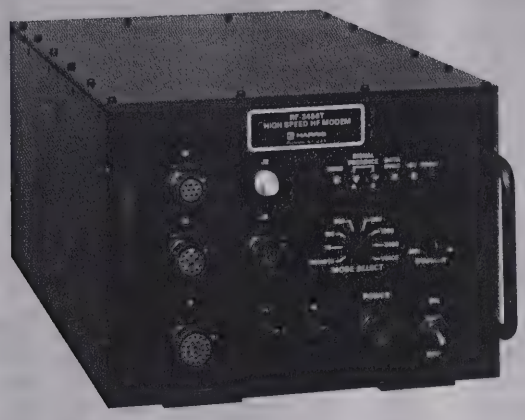


Figure 23. GRC-193A and Tactical Antenna Remoting Kit

HARRIS
RF-3466T HIGH-SPEED TACTICAL HF DATA MODEM



The Harris RF-3466T High-Speed Tactical HF Data Modem is an extremely rugged package designed to combat the anomalies of ionospheric propagation which limit the rates at which data may be passed over an HF radio link. A channel transmission rate of 3466 bits per second, achieved by time differential phase shift keying (TDPSK) of 39 tones, is combined with a Forward Error Correcting code to produce data rates ranging from 2400 to 75 bits per second. The unit is housed in a 1 ATR Package.

Features

- **Full-Duplex/Half-Duplex Operation**
- **Reed-Solomon Forward Error Correcting Code**
- **Code Interleaving for Burst Error protection**
- **Selectable data rates**
- **In-band diversity at low data rates**
- **Out-of-band (dual source) diversity at all rates**
- **Remote control of all operating parameters**
- **Adaptable to synchronous or asynchronous data terminals**
- **Built-in test**
- **Completely sealed**

Typical Applications

- **Narrow-Band Secure Voice**
- **High-Speed Burst Data**
- **Digital Facsimile**
- **Slow-Scan Television**
- **Multi-Data-Rate Operation**
- **HF, Tropo, Microwave, Land-Line**
- **Ground Mobile, Ground Fixed, Shipboard, and Airborne**

Description

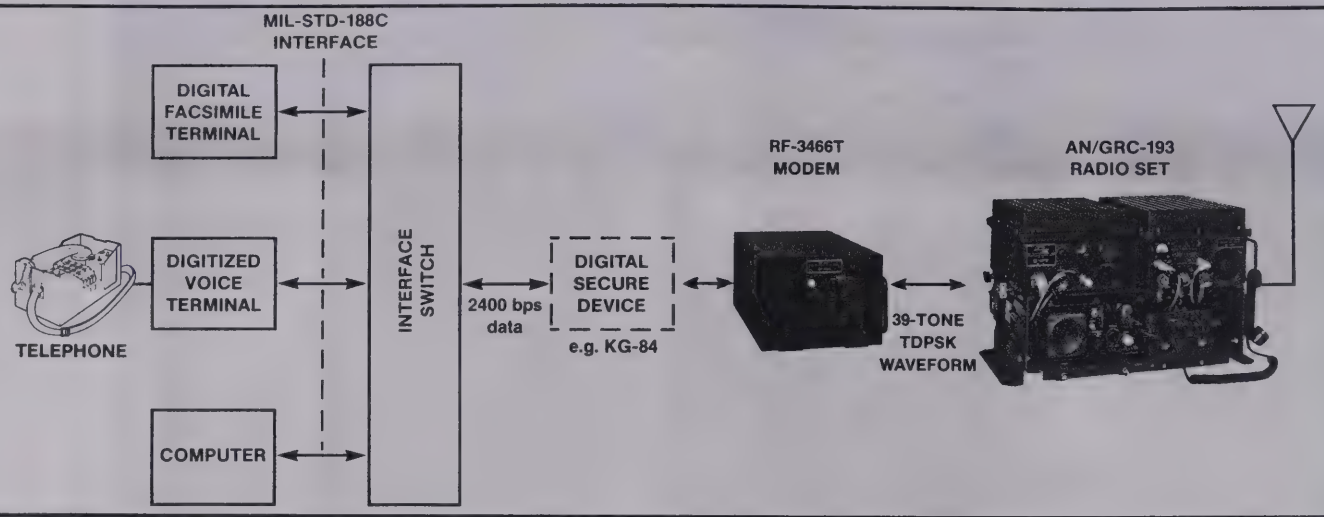
The equipment consists of a high-speed signal processing unit, synchronization circuits, clock and diversity functions, and input and output circuitry designed to interface to HF radio and data terminal equipment. When interfaced with a digitized voice unit plus an encryption unit, the modem provides secure voice transmission over HF circuits, with added protection against severe multipath and fade conditions. Additionally, the modem can be used for such applications as digital facsimile or high speed burst data within the tactical environment.

At lower data rates, in-band diversity combining techniques provide added protection in selective fading and low signal-to-noise conditions. Dual channel diversity is included, to support space, frequency, or sideband diversity.

The frequency error correction circuitry automatically corrects for doppler offset in the received signal and/or for frequency errors in the radios. Continuous synchronization is achieved through the use of digital filters.

Based on the new TMS320 digital signal processor and the 80186 microprocessor families, the RF-3466T is a powerful signal processing unit of great flexibility. The unit can be reprogrammed to support additional or alternate signaling waveforms by PROM substitution. Expansion PC card slots and ample power supply reserves are provided for future enhancements. Built-in test features verify modem performance at power-up, detecting module faults and identifying the failed module via front panel LED's. An enhanced BIT mode, requiring the use of an external ASCII terminal, provides an extended set of diagnostic functions which are very useful to maintenance and field service support personnel.

Typical Application Block Diagram for RF-3466T Modem



Specifications for RF-3466T High-Speed Tactical Data Modem

Electrical

Data Rates (bps)	2400, 1200, 600, 300, 150, 75
Modes	Full duplex, half-duplex
FEC Coding	(14, 10, 2) Reed-Solomon Code at 2400 bps; (7, 3, 2) Reed-Solomon Code at lower rates
Interleaving Delays	0, 0.33 sec, 4.2 sec, or 9.6 sec at 2400 bps; 0, 12.5 secs at 75-1200 bps
Tone Library	39 tones, 675-2812.5 Hz, 56.25 Hz spacing (ANDVT), plus one doppler tone 393.75 Hz
Diversity	In-band at 600 bps and lower data rates; out-of-band-dual channel at all rates
Modulation	TDPSK, 4-phase; IFFT tone generation
Demodulation	128 point FFT
Guard Time	4.72 ms
Integration Time	17.77 ms
Symbol Rate	44.44 frames/second
Sampling Frequency	7200 Hz
Preamble	Phase I (doppler) 4 tones (787, 1462, 2137, 2812 Hz) sent for 315 ms, followed by Phase 2 (sync) 3 bi-phase modulated tones (1125, 1800, 2475 Hz) sent for 180 ms
Doppler Correction	±75 Hz during preamble; tracking up to 3.5 Hz per second; automatic or manual disable
Synchronization	To within ±1.2 ms in acquisition; tracking up to one sample every five frames; automatic disable in low SNR
Channel Bandwidth	3000 Hz nominal
Dynamic Range	30 dB

Interface

Data	RS-232C, MIL-188C, or MIL-188-100 (synchronous or asynchronous), with automatic data inhibit in poor signal conditions
Input Audio	+10 to –20 dBm; 600 ohms balanced
Output Audio	+6 to –16 dBm; 600 ohms balanced
Radio Keyline	Open collector, 100 V, 50 ma; selectable delay (10 ms-1 sec)
Remote Control	RS-422; Harris-defined protocol
External Standard	Frequency—1.0 MHz; Impedance—50 ohms; Level—0.2 to 2 Vrms

Environmental

Shock	MIL-STD-810D, Method 516.3, Procedure I and VI. Functional Shock 20 g's for 11 ms.
Vibration	MIL-STD-810D, Method 514.3, Category 8—Ground Mobile, and Category 10—Minimum Integrity Test.
Temperature	MIL-STD-810D, Method 501.2 and 502.2; Procedure I, -40° C to +85° C storage; Procedure II, –10° C to +55° C operational.
Altitude	MIL-STD-810D, Method 500.2; Procedure I, 15,000 ft. storage; Procedure II, 15,000 ft. operational.
Submersion	MIL-STD-810D, Method 512.2; Procedure I, Basic Leakage.
Humidity	MIL-STD-810D, Method 507.2; Procedure III, Humidity Cycles.
Fungus	MIL-STD-810D, Method 508.3, 28 days.
Sand and Dust	MIL-STD-810D, Method 510.2; Procedure I, Blowing Dust.
Salt Fog	MIL-STD-810D, Method 509.2, 5% Salt Solution for 48 hours.
RFI	Fully operational in HF receiving and transmitting environment.

Mechanical

Size	1 ATR, 7.6H x 10.1 x 17.4D in. (19.3H x 25.7W x 44.2D cm).
Weight	34 lbs. (15.4 kg)
Connectors	MIL-C-26482

Power

Source	18 to 35 VDC
Dissipation	80 watts

Options

RF-3466T-04	Shock Mount.
10133-122	90-150/150-300 VAC, 47-400 Hz, single phase power supply.

8/84 REV. A 3MT
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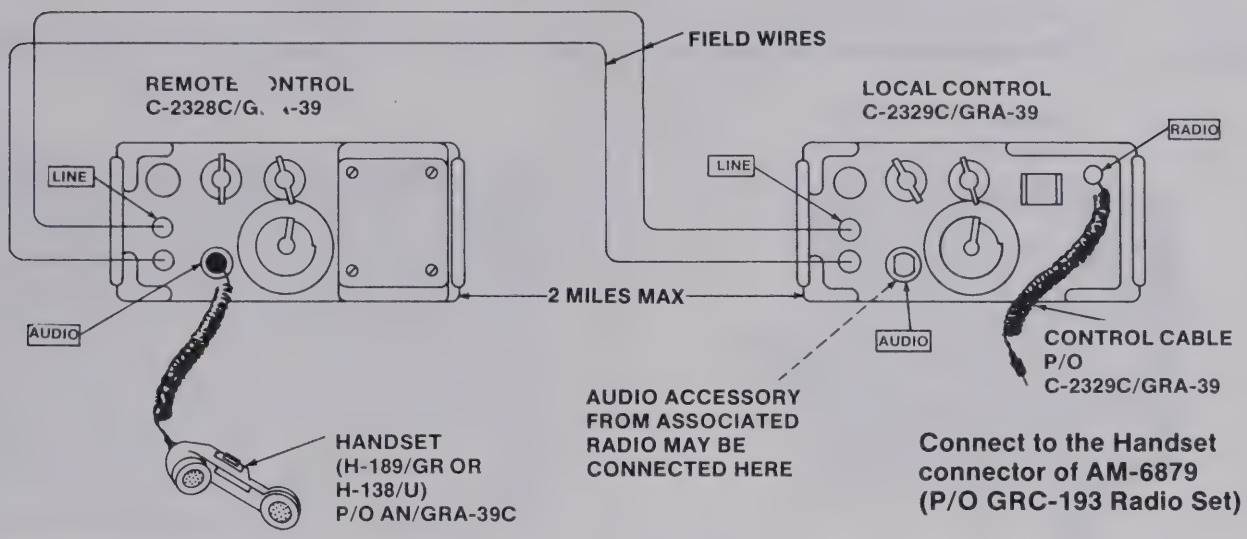
c. AN/GRA-39C Radio Set Control Group



The Radio Set Control Group AN/GRA-39C provides the means to control the remote operation of tactical radio sets. It includes Controls C2328C/GRA-39 (remote) and C2329C/GRA-39 (local), Handset H-189/GR, Carrying Bag CW-598/GRA-39, a bag and carrying sling. The local and remote units have additional rf filtering of the field wire lines to assure troublefree operation in close proximity to high power HF transmitters.

The local unit, the C2329C/GRA-39, connects to the radio set. The remote unit, the C2328C/GRA-39, may be situated up to two miles from the radio set and is connected to the local unit by 600-ohm field wire. Voice communications can be received and transmitted through the radio set and can be controlled either locally or remotely at the option of the operators. The remote unit contains a loudspeaker to monitor all received radio signals. The local and remote operators may signal each other with the built-in buzzer and then communicate without going on the air.

Technical Characteristics

Control, Radio Set C- 2328C/GRA-39

Control Distance (max)	2 miles
DC Power Supply	6 BA-30
Battery Life Expectancy	24 hours
Microphone Preamp Gain	55 dB
Microphone Preamp Output	5 mW
Driver Amp Output to Handset	5 mW
Power Amp Output to Loudspeaker	300 mW
Tone Generator Frequency	3900 Hz

Control, Radio Set C-2329C/GRA-39

DC Power Supply	6 BA-30
Battery Life Expectancy	72 hours
Microphone Preamp Gain	55 dB
Microphone Preamp Output	5 mW

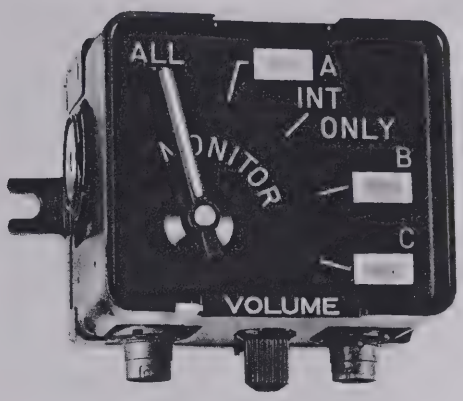
Handset H-189/GR

Earpiece Impedance	1 K ohms
Microphone Output	2.5 mV

AUDIO FREQUENCY AMPLIFIER AM-1780/VRC

This unit amplifies intercom as well as received audio signals. It also functions as a main control box and an interconnection junction. As a control box it applies power for intercom and radio operation, permits transmission by the commander or crew, and accentuates intercom audio to override the received signal. As a junction box it interconnects the radio set and intercom system.

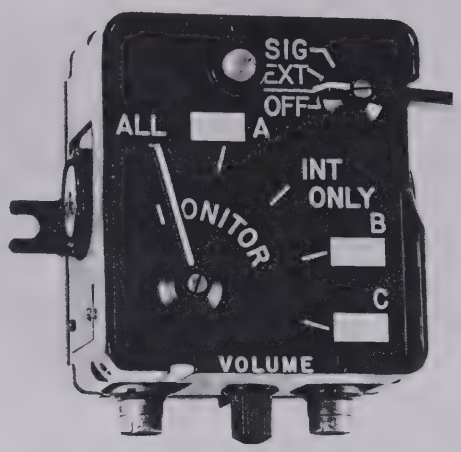
Power Source	26.4 Vdc nominal
Output Power	1W
Input Channels	4
Input Impedance	150 ohms (3 channels) 5000 ohms (1 channel)
Output Impedance	100 ohms
Frequency Response	300-3000 Hz ± 4 dB
Distortion	5% max @ 600-ohm load
Operating Temperature	-10° C to +55° C (14° F to 131° F)
Size	5-3/4 in. H x 9-3/4 in. W x 3-3/4 in. D (14-1/2 cm H x 24-3/4 cm W x 9-1/2 cm D).
Weight	8 lbs (3-1/2 kg)



INTERCOMMUNICATION SET CONTROL C-2298/VRC

This box provides radio and intercom facilities for the commander or other personnel in the vehicle. A selector allows reception and transmission on any or all receiver-transmitters in the system. A volume control adjusts the audio level of intercom and received signals.

Size	3-3/4 in. H x 4-1/2 in. W x 3-3/4 in. D. (9-1/2 cm H x 11-1/2 cm W x 9-1//2 cm D)
Weight	2-1/2 lbs (1-1/8 kg)



INTERCOMMUNICATION SET CONTROL C-2297/VRC

This box provides radio and intercom facilities to a crew member. Its functions are similar to those of the C-2298/VRC, but it also serves as a junction box for the C-2296/VRC. The unit includes a call indicator and means to signal the C-2296/VRC operator.

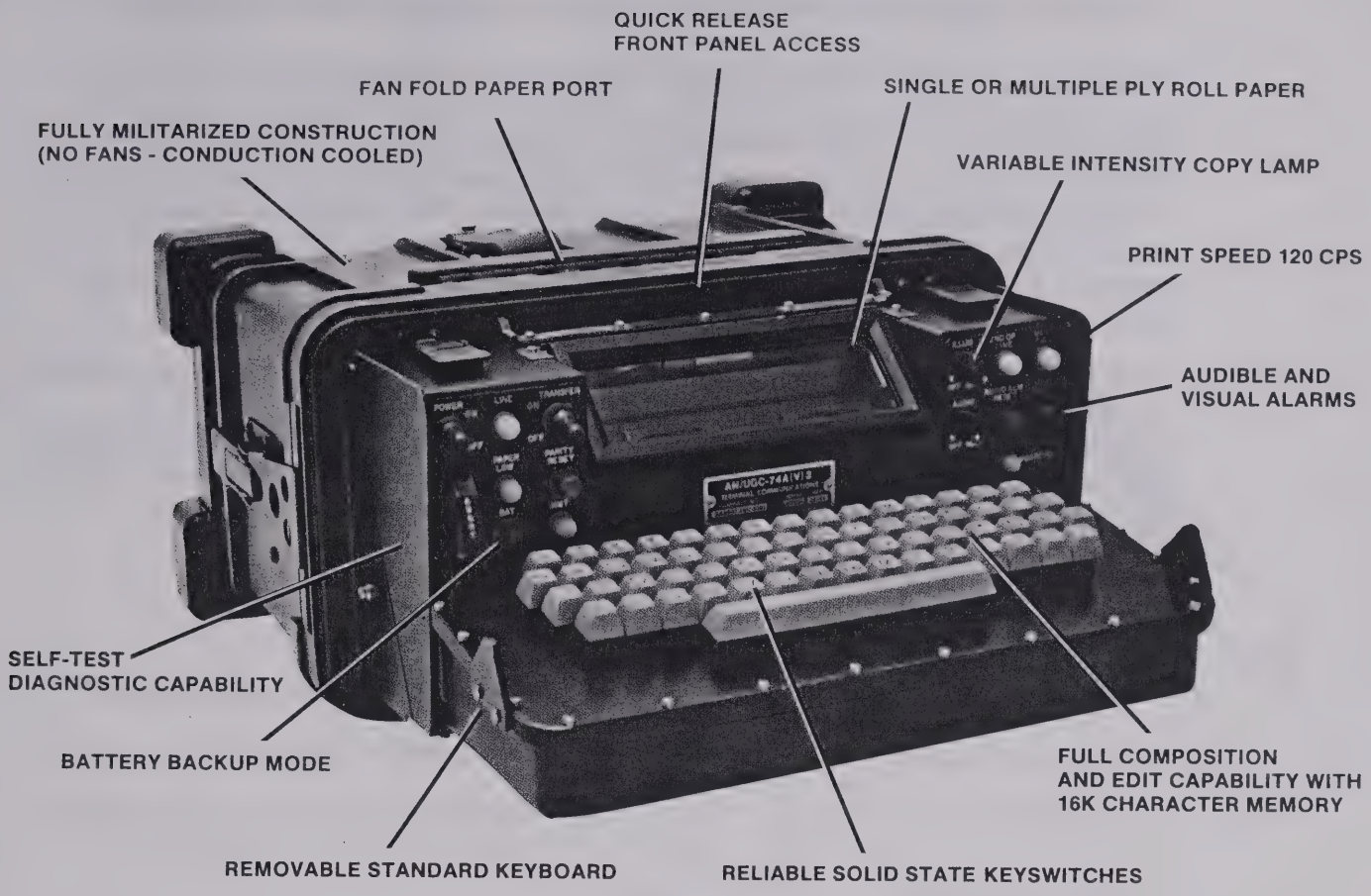
Size	3-3/4 in. H x 4-1/2 in. W x 4-7/8 in. D (12-1/2 cm H x 11-1/2 cm W x 9-1/2 cm D)
Weight	2-3/4 lbs (1-1/4 kg)

INTERCOMMUNICATION SET CONTROL C-2296/VRC

This box provides radio and intercom facilities to personnel outside the vehicle (through the C-2297/VRC). The unit includes a connector for a call indicator, and means to signal the C-2297/VRC operator. Handset H-207/VRC is supplied as part of the unit, and two terminals for a field telephone are provided.

Size	3-3/4 in. H x 4-1/2 in. W x 3-3/4 in. D (9-1/2 cm H x 11-1/2 cm W x 9-1/2 cm D)
Weight (including handset	4-3/4 lbs (2 kg)
(less handset)	2-1/4 lbs (1 kg)

e. AN/UGC-74 Teletypewriter

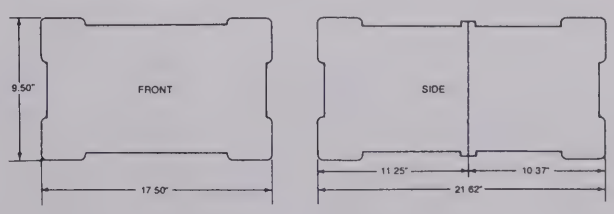


Performance Specifications

Operational Modes	Full duplex—ASCII (ITA-5) or Baudot (ITA-2) Codes
Transmission Modes	Message transmission from internal memory; Operator initiated by a key stroke command.
Reception	Direct message printout or message storage in internal memory simultaneous with composition.
Signal Interface	MIL-STD-188C (20 ma or 60 ma) MIL-STD-188-114 Normal input keying interface. Crypto compatible.
Reliability	2400 hour demonstrated MTBF at 100 percent duty cycle.
Operational Speed	ASCII—75, 150, 300, 600 and 1200 baud. ITA-2 (Baudot)—45.5, 50 and 75 baud.
Print Speed	60 characters per second minimum, average 120 characters per second English test (1200 WPM).
Print Characteristics	63 Character ASCII subset with diamond added. 12 characters per horizontal inch. 6 lines per vertical inch. 80 characters per line maximum.
Power Requirements	26Vdc or 115/230 Vac 50/60/400 Hz, 100 watts
Paper	Roll (UU-P-547) or sprocket fanfold (MIL-P-40023)

Environmental Specifications

Operating Temperature	-25° F to +155° F MIL-STD-810, Method 501/502
Humidity	98% MIL-STD-810, Method 507
Operating Altitude	40,000 feet MIL-STD-810, Method 500
Immersion	MIL-STD-810, Method 512
Dust	MIL-STD-810, Method 510
Tempest	NACSEM-5100, Details on request.
Vibration/Shock	
Resonance	MIL-STD-810, Method 514
Bounce, Vehicular	MIL-STD-810, Method 514
Bounce, Loose Cargo	MIL-STD-810, Method 514
Drop	MIL-STD-810, Method 516
Ballastic	MIL-STD-901
Rain	MIL-STD-810, Method 506
Salt Fog	MIL-STD-810, Method 509
Fungus	MIL-STD-810, Method 508
Nuclear Survivability	Details on request



Transit Configuration

f. Antenna, AS-2259/GR and Adapter, Antenna to Antenna Base MX-9313/GR

The AS-2259/GR HF Antenna is essentially a dipole antenna fed with a low-cost, foam-dielectric, coaxial mast that also serves as a support structure. The dipole system uses a set of crossed sloping dipoles positioned at right angles to each other. Physically the antenna consists of eight light-weight coaxial mast sections and four radiating elements that also serve as guys. The antenna is transported in a canvas pack similar to a tool roll. The total packed weight of the antenna is 14.7 pounds. Erection is accomplished by two men in five minutes without the use of any tools.

The AS-2259/GR antenna is designed to provide high-angle radiation (near vertical incidence) to permit short-range skywave propagation over communication circuits varying from 0 to 300 miles. The AS-2259/GR may be used with tactical hf radios that tune a 15-foot whip antenna. The frequency range of the antenna is 2.0 to 30.0 MHz and maximum rf power capacity is 1000 watts PEP, or average.

Electrical Characteristics:

Frequency range	2.0 to 30.0 MHz
Polarization	Horizontal and vertical simultaneously
RF power capacity	1000 watts PEP or average
Input impedance	Compatible with output of radios using 15-foot whips, such as the AN/PRC-47
Radiation pattern:	
Azimuth	Omnidirectional
Elevation	Near vertical incidence
Gain:	Similar to a dipole mounted horizontally, 10 feet above same type ground

Physical Characteristics:

Wind and ice	Survives 60 mph wind with no ice
Height erected	15 feet
Land area required	60 by 60 feet
Erection time	Two men, 5 minutes; one man 15 minutes
Packed weight	Less than 14.7 pounds

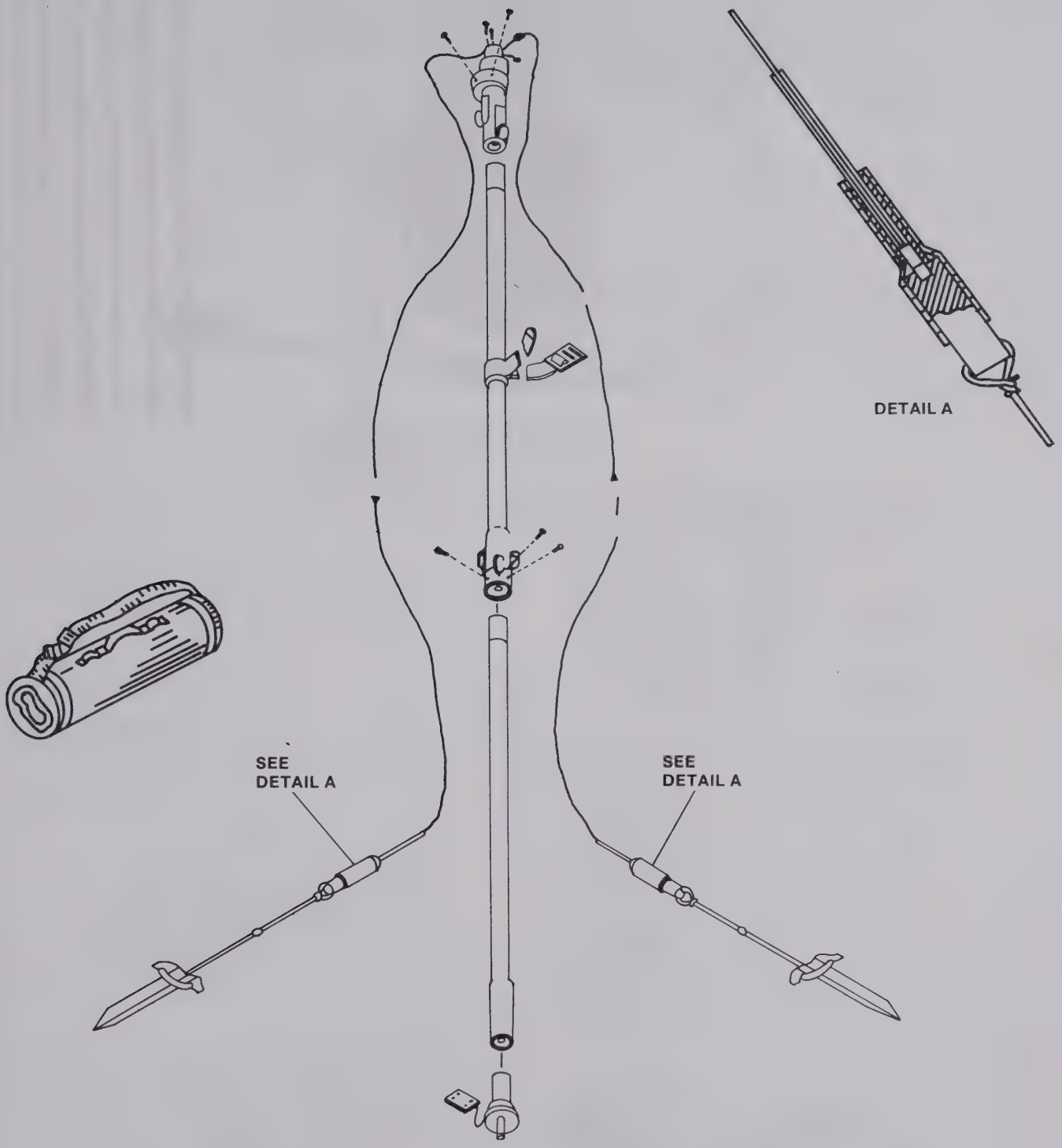


Figure 24. AS-2259/GR Antenna

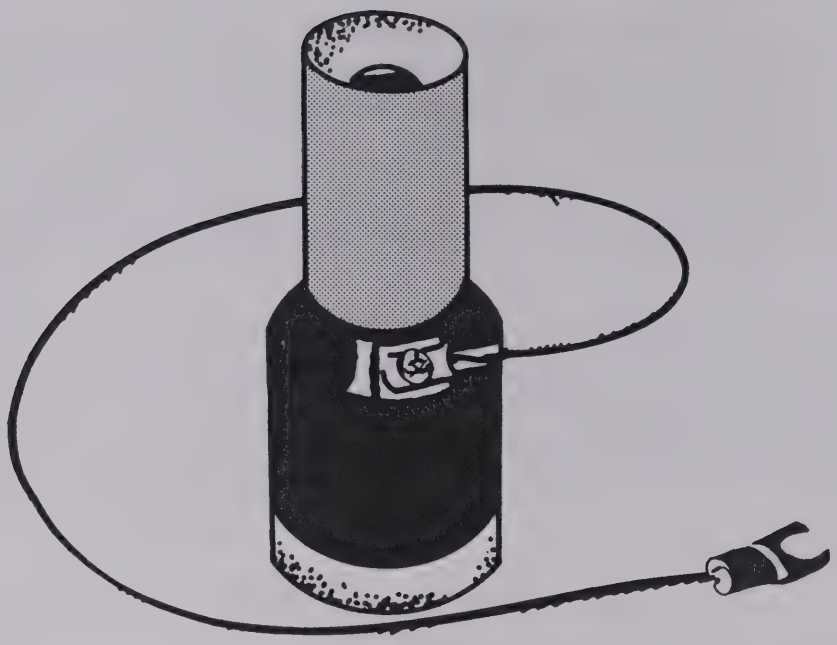
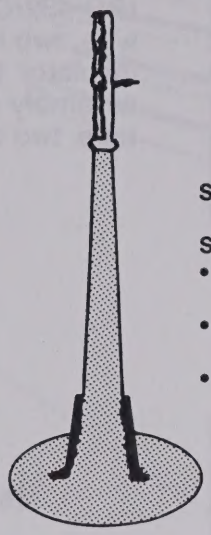


Figure 25. Adapter, MX-9313/GR

Used to adapt the AS-2259 Antenna to installations using 1-inch, 8 threads per inch whip bases (e.g., MT-2525)

	Nomenclature
A	AT-1039/U
B	AT-1040/U
C	AT-1041/U
D	AT-1042/U
E	AT-1043/U
F	MT-2525/U
	AT-1011/U

Order No.	Description
120-20	Antenna Element/Tip 52" Length-First Section
120-2	Antenna Element/52" Length-Second Section
120-34	Antenna Element/52" Length-Third Section
120-8	Antenna Element/52" Length-Fourth Section
120-14	Antenna Element/52" (4 Sections Necessary for 32 Antenna)
120-28	Stand-off Base (standard)
120-11	32-Foot (8 pieces) With Standard Base (120-28)
120-43	Feed-Thru Base/200 Watts-Male
120-44	Feed-Thru Base/200-1000 Watts-Male
120-45	Feed-Thru Base/Over 1000 Watts-Female



Style 120-28

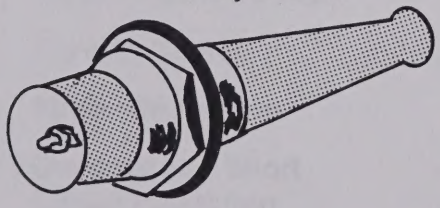
Stand-Off Base Style 120-28

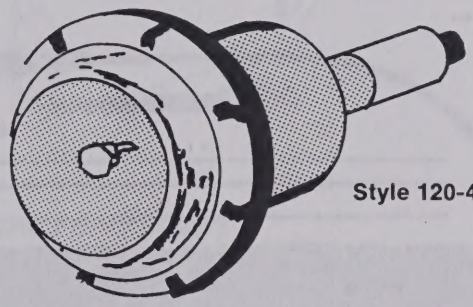
- 20½" (52 cm) high, painted steel casting with a 8½" (21.6 cm) diameter.
- Has six 13/32" (1.03 cm) diameter holes equally spaced on a 7¾" (19.7 cm) diameter circle.
- Comes with termination band with terminal lug. Net weight 10½ lbs. (4.76 Kg.)

Feed-Thru Base Style 120-43 Recommended for power up to 200 watts in the 2-30 Mc band.

- 15" (38.1 cm) high, 3" (7.62 cm) stainless steel base with 2" (5.08 cm) 12 NF threads, thread depth is 1½" (3.8 cm).
- Shunt capacitance is 8pf at 1 MHz.
- Requires 2" (5.03 cm) hole through mounting surface.
- Conductor at feed point is male ¼" x 20 UNC threaded brass rod.
- Supplied with two nuts and one lockwasher.
- Net weight 2 lbs. 7 ozs. (1.1 Kg).

Style 120-43





Style 120-44

Feed-Thru Base Style 120-44 Recommended for power up to 1 Kw in the 2-30 Mc band.

- 11" (27.9 cm) high, 4¼" (10.8 cm) cadmium plated base with 3" (7.62 cm) 12 UN-2A threads, thread depth is 1" (2.54 cm).
- Shunt capacitance, 8 pf at 1 MHz.
- Requires 3" (7.62 cm) hole through mounting surface.
- Conductor at feed point is male ¼" x 20 UNC threaded brass rod.
- Supplied with two nuts, one lockwasher and "O" ring seal.
- Net weight 3 lbs. 8 ozs. (1.58 Kg).

Feed-Thru Base Style 120-45 Recommended for power above 1 Kw in 2-30 Mc band.

- 11" (27.9 cm) high, 4¼" (10.8 cm) cadmium plated base with 3" (7.62 cm) 12 UN-2H threads, thread depth is 1" (2.54 cm).
- Shunt capacitance, 10 pf at 1 MHz.
- Requires 3" (7.62 cm) hole through mounting surface.
- Conductor at feed point is .922 diameter brass rod tapped ¾ deep with ⅜ - 16 UNC-2B threads.
- Integral "O" ring seal included.
- Net weight 4 lbs. (1.8 Kg).

Style 120-45

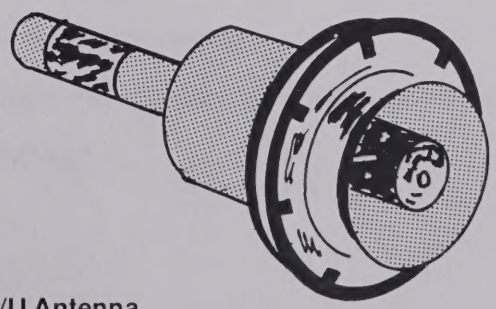


Figure 26. AT-1011/U Antenna

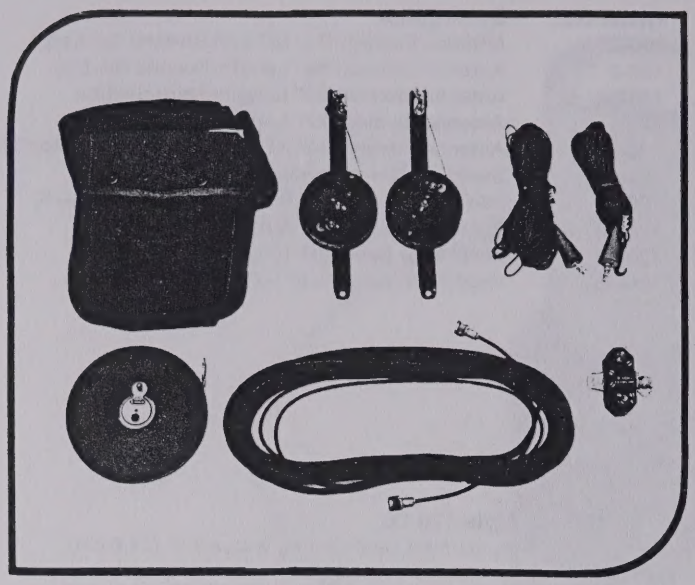


Figure 27. AN/GRA-50 Antenna

DOUBLET ANTENNA

A canvas bag (BG-175) is used to store the parts of Antenna Group AN/GRA-50. This doublet antenna has (clockwise) two reeling machines (RC-432/C), each with 160 feet of wire, two halyards (MX-20706/C), insulator 1L-4/GRA-4, an rf cable assembly (CG-678/U), a measuring tape, two connectors, and two ropes.

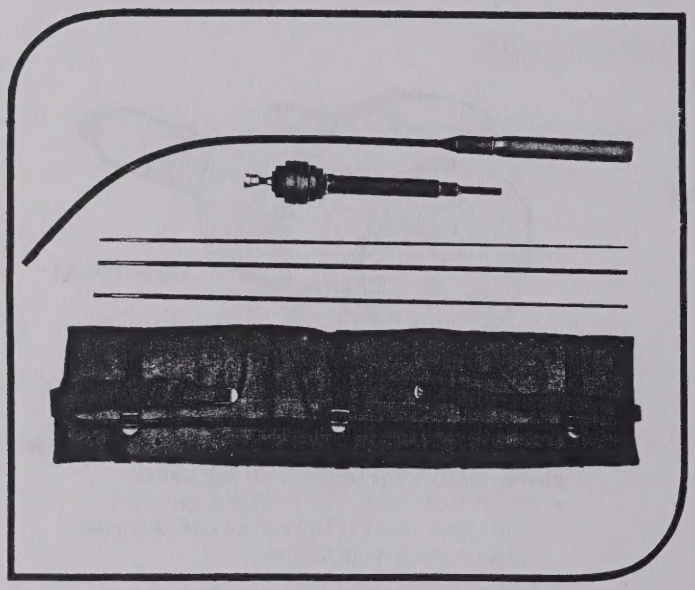


Figure 27A. 15' Whip Antenna

15 FT. WHIP ANTENNA

The vehicular antenna consists of an antenna cover, a mast base (AB-652/GR), five mast sections (MS-116A (3 units), MS-117A (MS-118A) and a bag (CW-206/GR).

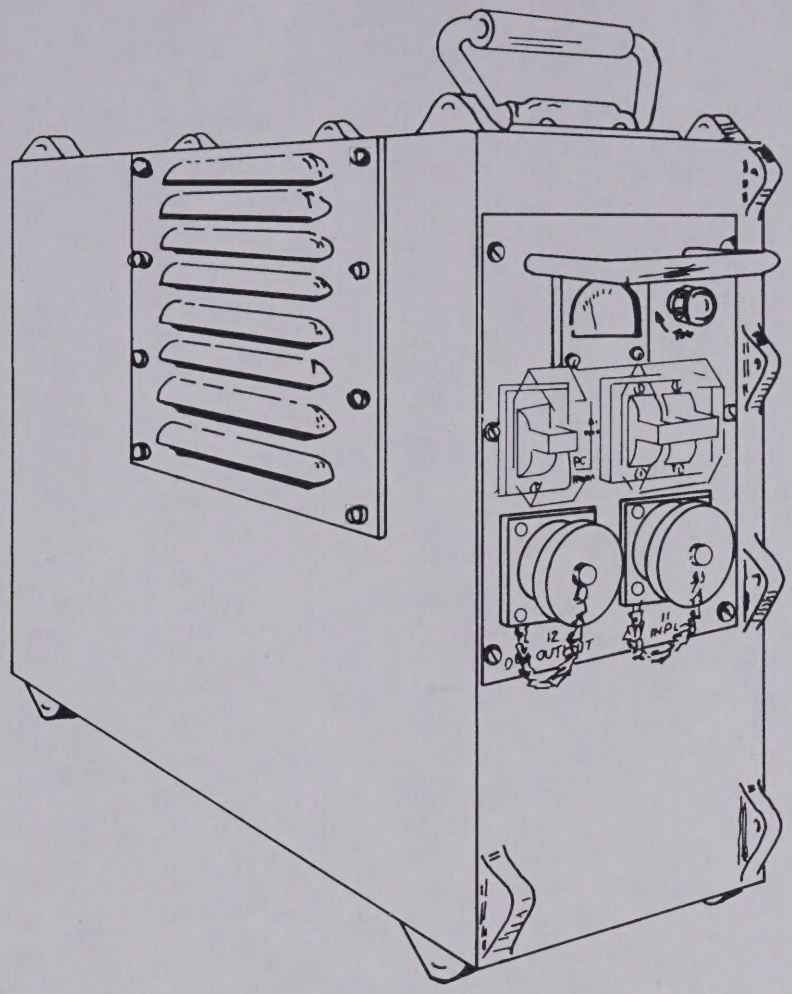
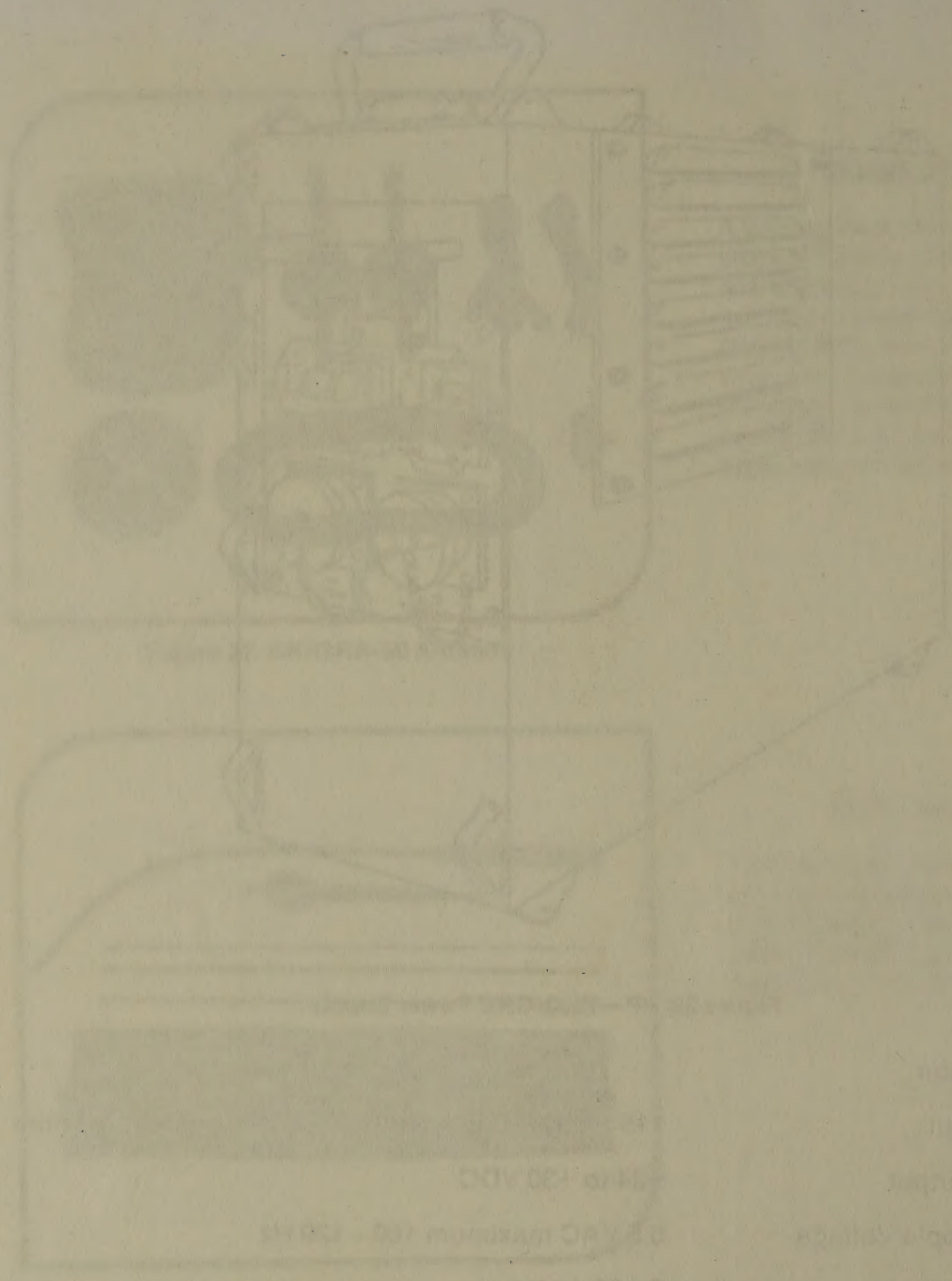


Figure 28. PP—7333/GRC Power Supply

Specification	Requirement
Power Input	115 ±II.5 VAC, 50-60 Hz, 10, 20 Amperes maximum
Voltage Output	+24 to +30 VDC
Output Ripple Voltage	0.5 VAC maximum 100 - 120 Hz
Current Output	0 - 60 Amperes
Power Dissipation	300 Watts
Overload and Short Circuit Protection	75 Ampere DC output circuit breaker 25 Ampere AC input circuit breaker
Ambient Operating Temperature	-65.2° F (-54° C) to 149° F (+65° C)
Humidity Limits	Up to 95% relative humidity
Size	7½" (19 cm) x 17½" (44.5 cm) x 16¾" (42.5 cm)
Weight	99 lbs. (44.9 kg)



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